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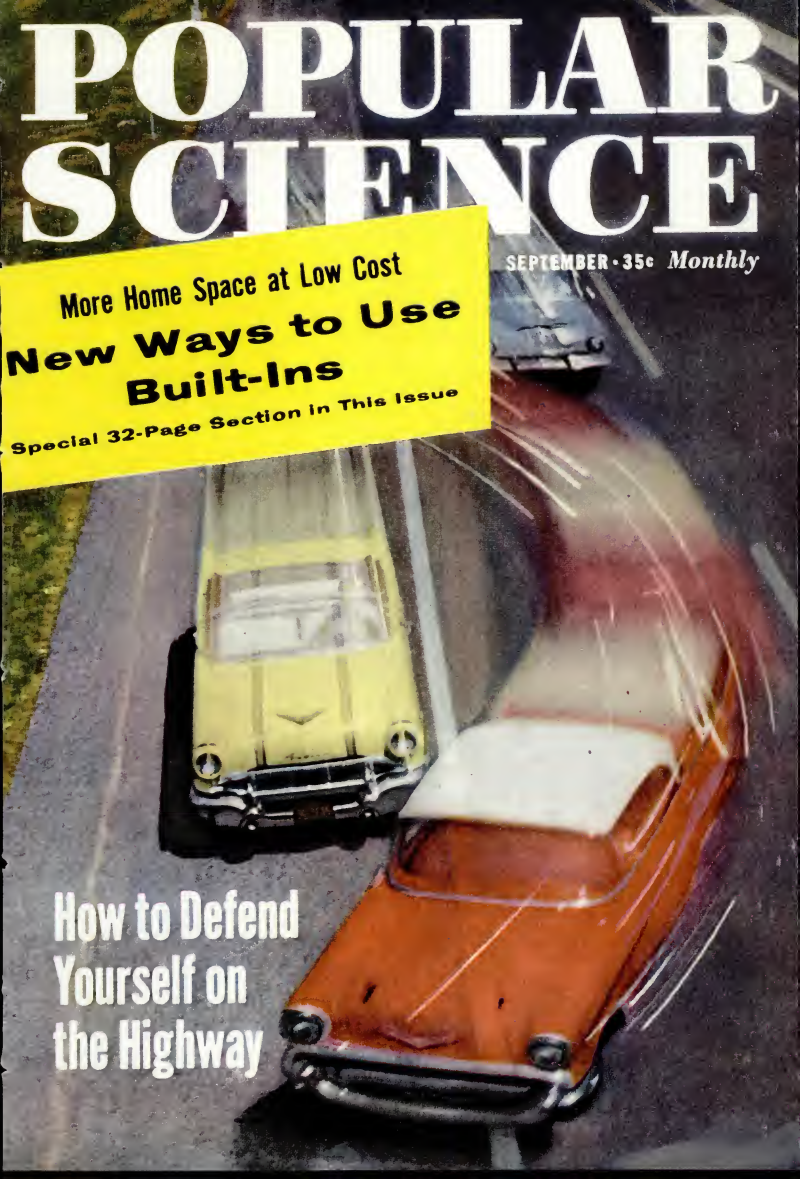

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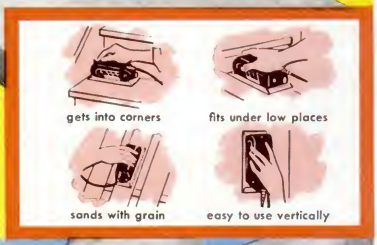

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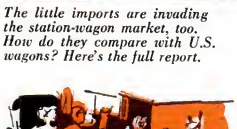
Popular Science Monthly

September, 1958

Cover by Arnold Eagle for Cities Service

The little imports are invading the station-wagon market, too. How do they compare with U.S. wagons? Here's the full report.



Buying or building a home? PS shows you how to get more house for less money—in the basement.

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Now . . . a complete roundup on modern built-ins tells you everything you should know to convert the dead-ends in your home to handsome, space-engineered storage areas. PS experts tell you how to build built-ins; where to get free plans; how to select and install hardware, doors and drawers; and even, in case your saw is rusty, how to buy a built-in.

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PS Readers

TALK BACK

Mush-Boxes?

YOUR tactful restraint about the gas-gulping habits of the automatic transmission ["Yes, the New Cars *Do* Take More Gas," July] is too polite. Anybody who buys a car fitted with one of those lazy, gluey mush-boxes—all for the simple-

witted joys of pushbutton driving—deserves every one of the penalties he's purchased for his extra $175. Degraded performance, costly maintenance, increased noise, extra brake wear, additional cooling-system load, shortened engine life, and three or four miles-per-gallon of wasted gas serve the foolish fellow right.

DANA SMITH, Wellesley, Mass.

Unit-Car Admirer Calls Foul

LET me throw my two cents into the discussion on unit vs. frame construction. In the piece on head-on crashes [June], you picture a Nash Statesman and a Pontiac meeting, and a Rambler pitted against a Ford. The difference in weight is so vast that the American Motors cars didn't have a chance. Next time tell that handsome ex-pilot to use an Ambassador, or one of AM's V-8s.

I've taken part in similar tests, not to mention a couple of unplanned collisions while a passenger. I believe that it was unitized construction that saved my life on two occasions.

W. J. BERGMANN
Ft. Leonard Wood, Mo.

Weight does affect damage, and in the collisions mentioned the weight difference was sizable, about 10 percent. However, some of the measurements (deceleration, for instance) also varied by as much without proving anything (that is, they were not statistically significant). So the weight difference can probably be ignored. The UCLA experiments did not *prove that unit construction had no safety advantage. They only showed that the advantage, if it existed, was not obvious.*

Thawtful Reeder Takes Objektive Vew

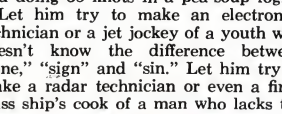
YORE Joon ishyou haas a lettur sayin ower skools is wastin ower chillurns time teechin em spellin an grammer. He shure is rite!

If ower pore chillurn wants tew lurn siunse whi fritter away ther time lurnin em how to reed texbooks kereckt er how to rite up ther siuntifick findins so as uther peepil can unnerstan it?

STANFORD GILLEY, Terre Haute.

. . . Mr. Klaus's letter [June] would be unbearably funny if it weren't for the thought that it was designed to encourage and make worse a situation already tragic. When he speaks of too much preoccupation with spelling and grammar in our schools, he's 180 degrees off course and doing 35 knots in a pea-soup fog.

Let him try to make an electronics technician or a jet jockey of a youth who doesn't know the difference between "sine," "sign" and "sin." Let him try to make a radar technician or even a first-class ship's cook of a man who lacks the



necessary background in spelling and grammar for comprehension of service textbooks and instruction manuals.

H. O. AUSTIN, FPO, San Francisco.

It's Around in Back

YOUR drawing of a twin water-heater hookup ["Short Cuts and Tips," July] might be the answer to the launching

"HOW A 'CRAZY RUMOR' GOT ME PROMOTED!"

What I overheard one morning shook me right out of a rut!

"Company's getting ready to cut back . . . bound to be layoffs," I heard them say. "Just another crazy rumor," I told myself.

Just the same, I took quick stock of myself that night. Came up with four good reasons why the company would keep me on:

Three years' experience
Getting along with foreman
Turning out acceptable work
Prompt and dependable

And four just-as-good reasons why they might let me go:

Making no real headway
Others better qualified
Still rated "semi-skilled"
Needs special training

I wasn't in trouble. But I sure wasn't "in solid" like I should be. That's when I made up my mind to enroll for training with I.C.S.

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That was a year ago. There have been two layoffs since then. While some of the others were just hanging on or being released, I was moving up. My I.C.S. training started something. Not only did it get me promoted (with a fat pay hike), but it put me in line for real advancement.

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vehicle needed for our space satellites. What a source of power!

Anyone trying this hookup better install a temperature and pressure-relief valve on the second heater. Without it, there's enough potential power in the arrangement to launch heater and dwelling skyward.

J. W. Remington, Rockford, Ill.

No Match for Ripple Rock

It is apparent that Elliot Marple ["The Blasting of Ripple Rock," Mar.] is a much better writer than blaster. He writes of Primacord: "These high-speed fuses burn at the astonishing rate of 21,000 feet per second." This is correct, but he goes on to say that it is ignited by a match. The Ripple Rock blast was fired electrically. If "a nervous hand touches a flaming match to the detonating cord," as author Marple suggests, the owner of that nervous hand will fire his next shot with his elbows.

Pfc. M. A. Reid, Kure Ammo Sub-Depot
APO San Francisco.

Winning Friends on the Moon

After reading "Timetable to the Moon" [May], I wonder if we have not forgotten something. On earth, life may be found in the ocean depths or in regions far too cold for the survival of most of us. How do we know that life does not exist on other planets or the Moon?

I dread the thought that intelligent minds on other planets might explore ours with atomic bombs. Throwing stones over a fence without knowledge of what is on the other side is not a logical way to gain knowledge—or impress neighbors.

N. G. Mulley, Arlington Heights, Ill.

Bad Drivers and Sex

Just finished reading "Why Bad Drivers Drive That Way" [June]. Trooper Burchette is just about as courageous as they come when he states: "When I want a car behind me to dim its lights, I flick mine. If it's a man he usually understands. But women don't get it at all."

Many gals do a lot of traveling but they are far outnumbered by the guys

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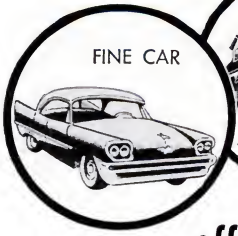

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who make my blood boil. These are the ones who refuse to dim their lights while behind you (though you flick yours), tire of that and start tailgating (though you're right on the legal speed limit), tire of that and flash around you across a double white line and then invite you to an accident by cutting back in too soon.

Give me a woman with common sense over a know-it-all cowboy whose main qualification for being on the highway is the fact that he learned his driving on a

tricycle in preschool days, grew up chronologically, but left his common sense with the trike.

MRS. R. W. SHUPP JR., Alexandria, Va.

. . . Your idea of learning all about bad drivers in an evening was good, but the execution failed miserably. With roughly 42 million drivers in the country, your sampling comes down to 71 one-millionths of one percent. On this basis, the author proposes to come to some conclusions. Statistically, that's unjustified: It just isn't possible.

Furthermore, only one geographical area was studied and there was no breakdown of drivers by profession, economic standing, age, sex, education, or residence (urban or rural).

H. R. PRAGER, Chicago.

Rear Axle Catches Impact

Wow! Those head-on collision pictures ["What *Really* Happens in a Head-On Crash," June] are something. One, though, puzzles me. That's the before-and-after view from underneath the Ford (lower right, p. 63). The rear wheels seem to toe in. The rear axle couldn't have snapped, not in a front-end accident. Or could it?

SAM R. LOGAN, Phoenix.

Almost. The rear axle was bent badly. The impact was transmitted along the transmission and its mounts, through the driveshaft, and finally to the axle housing. The rear wheels held, so the axle

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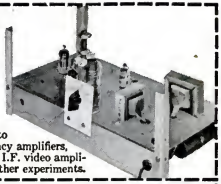
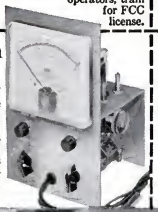


YOU BUILD Signal Generator

N.R.I. sends kits of parts to build this Signal Generator. You get practical experience, conduct tests to compensate Radio frequency amplifiers, practice aligning a typical I.F. video amplifier in TV circuit, many other experiments.



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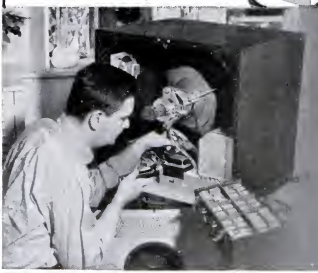

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gave. After the crash, both U joints were cracked and the driveshaft hung free.

Small-Car Rollovers

AFTER reading "How Dangerous Are the Small Cars?" [July] this VW owner has a question regarding the ratio of rollovers to collisions.

Most rollovers would seem to occur independently of other cars—the result of reckless or inefficient driving. On the other hand, collisions involving two cars involve the foibles of two drivers and/or their ability to evade one another.

Could it be that the latter are more easily avoided in the small, more maneuverable light cars?

PAUL A. MARTIN, Newton, Iowa.

. . . If my husband and I had been riding in an American car instead of a VW 2½ years ago, we wouldn't be here today to comment on your interesting article.

We rolled our "mouse" on a curve doing 60 and climbed out without a scratch. I had a sore neck and arm for a few days, but I could have had a broken neck if we had happened to be in a Detroit monster with lots of room to tumble around in.

MRS. R. E. VAN BUSKIRK, Dyer, Ind.

Flattening the Car Hump

PROPOSED methods for getting rid of car hump ["Next Big Change in Cars: Flatter Floors," July] involve retention of the mechanical linkage of engine to wheels. What about the electric-wheel system, used on some earthmoving equipment?

Advantages at first glance: Elimination of drive train; no power transmission through universal-type joints; an infinite number of "gear ratios," provided by a field-current rheostat; and less frictional power loss.

Disadvantages: Cost, weight, space requirements, cooling, effective insulation (especially in event of accident), and electrical inefficiencies.

Can you evaluate the relative merits of these systems?

DICK SPIRO, Bronx, NYC.

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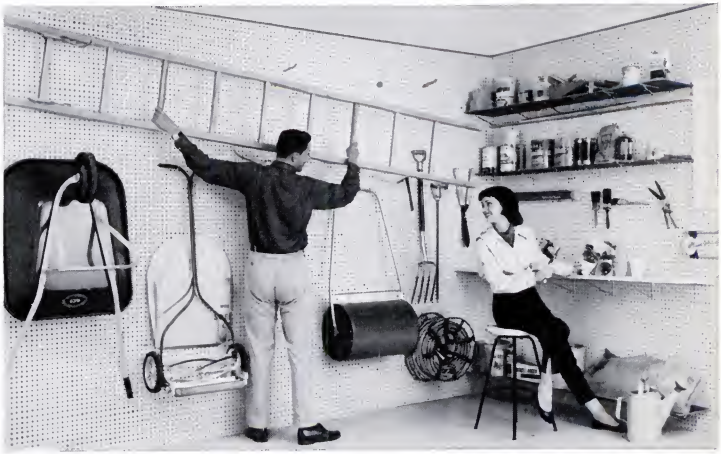

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The month in science

Space war in the Pentagon. The long-simmering conflict over space exploration—How fast should we go? In which direction?—is boiling over. Recent eruptions: a colonel's resignation-via-press-conference; a general's polite but open back-talk to the Secretary of Defense; the hassle over organization of a permanent space agency.

On one side, the Government's top civilian advisers—the big-name professors from Caltech, M.I.T., Cornell—are pushing basic research, the unglamorous and slow collection of facts about nature. Their argument:

- Every achievement—in space or elsewhere—must be fashioned from these basic facts.
- The store of unexploited knowledge is emptying fast, is already bare for some important fields.
- New knowledge can no longer be imported in bulk from Europe—our traditional source—but must be unearthed here.

This first-things-first attitude was behind Caltech president Lee A. DuBridge's blast at demands for pushing a man into space right away [PS, June]. The same kind of thinking forced postponement of the atomic airplane (the engine is ready, could be installed in a B-36, but will probably be held for construction of a "useful" air frame to go with it).

Now the crash-program advocates are screaming. Loudest are the military-research chiefs (although the fracas is not solely gown-against-uniform). Said Lt. Gen. S. E. Anderson, "Basic research is increasing, but technical development is falling behind. We really don't have an astronautics program going." He (and others) point to the satellite fiasco as an object lesson.

The scientists take the rap—privately—for misjudging satellites. They knew the Russians might get one up first, but failed to foresee the furor this would cause. Yet they continue to rate as secondary the flying A-plane or the man into space.

Actually, there is no real choice between the two approaches. We must have solid knowledge for sound achievements. But we need achievements, even imperfect ones, just as badly.

The trouble is money. Equal emphasis on both objectives would cost more than the country now seems ready to spend.

International Health Year? Success of the International Geophysical Year raises hopes for world-wide cooperation on medical research. The Russians are coming through nicely with IGY data (though some cynics suspect they publish those results that confirm what everybody thought, but clam up on exciting new findings). Now they're warming to President Eisenhower's idea for a global attack on disease.

The President suggested pooling research on cancer, heart ailments and malaria; backed his proposal with an offer of money.

The Russians said okay, but also want a big push to wipe smallpox off the earth by 1962. They have now eradicated smallpox at

home (as have the U. S. and other industrial countries), and want to avoid reinfection from outside.

The big campaign will be assigned to the World Health Organization (a semi-independent affiliate of the United Nations). WHO has already scored impressive successes in its 10 years:

- Malaria, which still kills 1,500,000 people a year, claims only half as many victims as a decade ago, largely because of WHO effort. WHO aim is complete eradiction by 1965. (One reason for the hurry: The chief weapon is DDT, and malaria-carrying mosquitoes develop resistance to it.)
- Yaws, which sickens 50,000,000 people in the tropics, will be eliminated in a few years. WHO has already cleaned it out of Haiti (with penicillin). Same program also fights syphilis.
- Tuberculosis, no longer the number-one killer in the U.S., still is elsewhere. By now WHO has tuberculin-tested 200,000,000 people, screens another 1,600,000 every month in India alone.

They grow bigger every year. If you've happily discovered that your wardrobe is safe from your teen-age son because he can't fit in your clothes anymore, you're not alone. People keep getting bigger, as clothing and bed manufacturers are learning.

Hart, Schaffner & Marx report that the average size of their suits jumped from around 38 to 41 in 30 years. And they now sell only half as many "shorts"—but twice as many "longs."

Probable reason: food. Scientists now think diet outweighs heredity in determining stature. Comparing Japanese youths with Americans of Japanese ancestry, they found that both groups overshadowed their parents, but the better-fed Americans did so by a bigger margin.

The car in your future. Crystal balls were fine-tuned sharp and clear at this summer's SAE meeting. Among the pictures:

- Compression ratios. On up to 17:1, with gains in efficiency and economy, if gas companies can make the fuel. Beyond that, said GM's D. F. Caris and E. E. Nelson, you need a completely new engine design.
- High-performance fuel. Phosphorus additives and some changes in formula make gas palatable for super-high compression ratios. Big problem they lick is "rumble," defined by W. M. Wiese (GM) as a "low-pitched thudding noise different from knock."
- Glass auto parts. Pyroceram, tough glass-ceramic (missile nose cones), looks good for piston heads, bearings, brake shoes, reported Corning Glass's W. W. Shaver and S. D. Stookey.
- Quiet truck tires. For least noise, no tread at all, said Firestone's T. A. Robertson and J. H. Cox, but zigzags, parallel grooves or uneven spacing help a lot.

Martin Mann

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A leak caused by bad pipe threads can also be stopped with string. Separate the cord and wrap a single strand around the exposed threads. Tighten the nut over the string for a leakproof fit. String also works, in an emergency, on moving parts such as faucet stems and swinging spouts.

2 A light-switch lock like this in a darkroom can prevent ruining a batch of film. It's just a thin piece of metal or plastic held by the top screw of the switch plate. When turned to "off" position, the light can't be turned on.

3 Keep paint rollers clean and dust-free and they'll last longer. Instant-coffee jars with screw-on tops make good storage vaults for the small rollers that are used for painting trim.

4 An egg with a cracked shell often turns up in the dozen. Before storing it, reseal it to keep it fresh by covering the crack with a patch of plastic tape.

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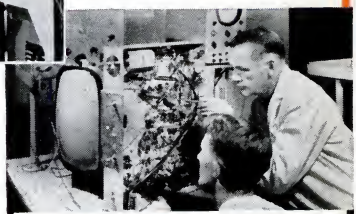

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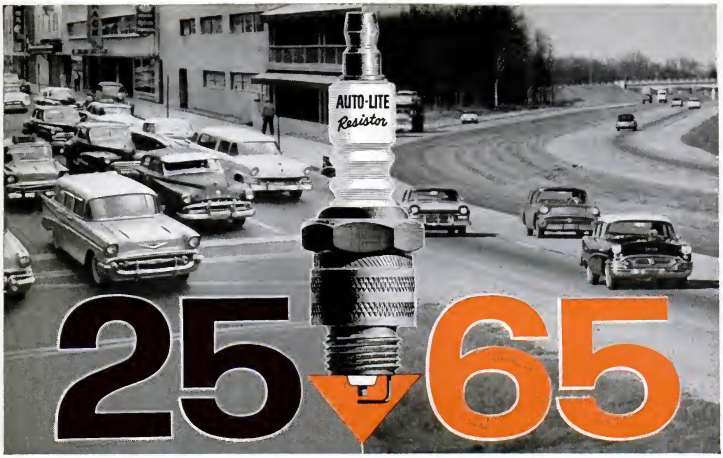

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You ought to know...

How high is your calorie cost of living? The chart below, published in the Journal of the American Medical Association, is a good gauge of the potential fat you can burn up. Its list of homey chores and recreations is matched with the caloric energy each one costs you per minute.

The age of 25, says the AMA article, is the turning point in your waistline's history. From then on, you may develop an imbalance in your energy input and output. The result is that some people—men more than women—gradually take on weight.

How many calories-per-minute do you spend?

EVERYDAY ACTIVITY	COST*	SPORT	COST*
Walking upstairs	10.00	Swimming	6.06
Walking outdoors	3.07	Boxing	5.00
Making a bed	2.64	Tennis	3.50
Washing clothes	1.46	Golf	2.76
Standing	1.41	Dancing	2.00
Sitting reading	.70	Table tennis	2.00
Resting in bed	.68	Snooker pool	1.50

**Calories expended per min per sq. meter of body surface. A male 5' 10", 157 lb., has a surface area of 1.87 sq. m.*

Over the years, a person's work may stay the same, but his calorie consumption creeps upward. Or his diet doesn't change, but he advances to cushier, less energetic work. Either way, the fatty pounds accumulate. Small people may take them on more easily than six-footers. The reason: A small man burns fewer calories at the same work than a bigger man.

The trick is simply this: Cut down on your energy input by a few calories a day (though not without your physician's okay). Same time, take up an extra-active recreation, to boost your energy output. From 10 to 15 calories a day can mean a difference of up to 15 pounds in 15 years.

Fat won't come off any easy way, points out one medical researcher. He calculates that 370 hot one-hour baths will take off one pound. Massage is no better: A beefy masseur administering a heavy rubdown will probably lose more weight than his client on the massage table.

The '59 cars will lose some frills. But they are mostly assembly-line variations. You'll hardly notice they're missing. The front office passed the word to production men that they must cut manufacturing costs, now that labor and materials are up. Here are some cost cutters GM is trying:

- Hard-top station wagons. These may be dropped, despite their popularity. Those pillarless tops cost too much. So wagon styling will trend toward more conventional design.
- Front-door panels. Thirty-four different door panels went into GM's '58 models. But only 10 types are slated for the '59s.
- Body shells. One of GM's three basic body shells is out for good. Cadillac will have one of its own. Chevy, Pontiac, Buick and Olds will all share different combinations of the other.

Trimming like this won't seriously restrict the stylists. Door

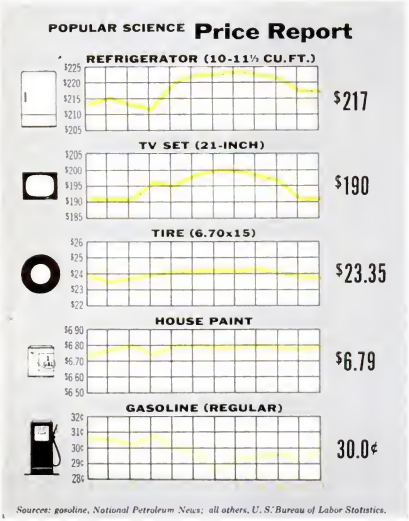
You ought to know...

panels all look pretty much alike, no matter how you shape them. One body shell among four name plates isn't limiting, either, although Chevy and Pontiac will become a few inches larger all around.

New gas ranges will get an added safety device. Automatic ignition (pilot lights) for ovens and broilers is a must for ranges built after January, 1959. Otherwise, they won't get an approval stamp from the American Gas Association, the industry trade group. Of the ranges sold last year, only 23 percent had automatic oven lighting.

What's doing with Detroit-built small cars? Ford and GM blueprints are just about frozen in major decisions. Contracts are being placed for the tooling to produce them. Only burning question left now, say Detroit sources, is which plants will turn out the cars.

The manufacturers have decided what's going under the hood, though they're still vague about the *style* of the hood.



Sources: gasoline, National Petroleum News; all others, U. S. Bureau of Labor Statistics.

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Ford plans a conventional in-line "six" engine—smaller but not radically different from the one it offers now. This similarity will help get the engine out in record-breaking time. Ford is shooting for a production date that will permit delivery of new models possibly as early as October, 1959.

General Motors has settled on a horizontally opposed six-cylinder engine. It uses a lot of aluminum in the block and head, and it's rear-mounted. The body: unitized construction. Outsiders haven't heard the GM deadline yet.

Chrysler, so the rumor goes, has shelved plans for a U.S.-built small car. Blame it on financial difficulties.

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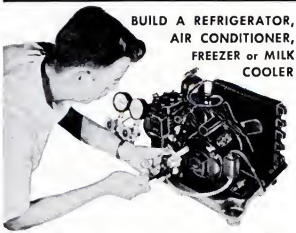

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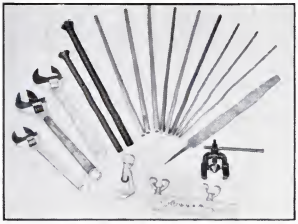

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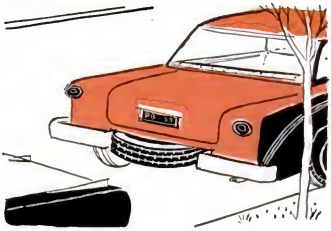

A HORIZONTAL TIRE RACK beneath the car so the spare would serve as a pneumatic bumper. To free the tire, you'd unlock the rack and slide it out.—*E. L. Gallini, Springfield, Mass.*

DECALS OF WOOD KNOTS to cover nailheads in knotty-pine paneling. Toenailing at the tongue may be inadequate, and surface nailing can be ugly.—*J. G. McGowan, Springdale, Conn.*

A FAN ATTACHMENT for a drill press to blow the chips away. A vaned cylinder that could be attached over the chuck should do the job. —*Bill Corney, Dearborn, Mich.*

ILLUMINATED ELECTRIC RAZORS. Built-in lights would make it a lot easier to get a clean shave in bathrooms where the only lighting is overhead.—*H. L. Linenberger, Bastrop, Tex.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by POPULAR SCIENCE readers. What's *yours?* We will pay $5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

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The Case of the Disgruntled Bargemen

A BARGE loaded with scrap iron was floating in a canal lock, with the gates closed, when word came that the barge owner had gambled away the men's wages. Enraged, the bargemen threw the iron overboard, until the barge was empty of cargo.

Assuming that the gates remained shut the entire time, what happened to the water in the lock? Did it go up, down, or remain at the same level?

ANSWER: Since the barge and scrap iron are both still in the lock, it might be imagined that the water level stayed at the same height. Or it might be supposed that the iron displaced enough water to raise the level. But the water level sank.

According to Archimedes, any *floating* object displaces a volume of water equal in *weight* to its own. The iron-loaded barge displaced a bulk of water weighing as much as itself and cargo. But when thrown overboard, the iron can displace only its own *bulk* of water, a volume far less than its own weight of water. So the iron sinks and the water level falls.

If you imagine the cargo to be a one-inch cube of superheavy matter such as exists on some stars, the point becomes even plainer. Such a cube would weigh several tons. If it were dumped overboard, the lightened barge would rise, displacing much less water. The cube itself would displace only its own tiny volume. So the water level would fall far down.

Adapted from Puzzle-Math *(Viking Press). Copyright, 1958, by George Gamow and Marvin Stern*

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

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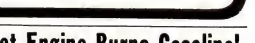

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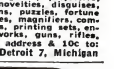

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It is easy to see why the Claim Investigator plays a leading part in almost every one of the twenty-five million auto accidents that occur each year, and why the demand is so great that there is bound to be a shortage of trained men. There is always a desperate need for trained experts who can take over and make fair and prompt decisions.

But Money Isn't ALL You Get!

The foregoing are *facts*...facts you can easily verify if you care to check with *any* insurance company or *any* law office. And it explains why *even beginners* in the field of Claim Investigating can count on a good starting salary of as high as $400 a month.

But a salary like this is only the beginning. Insurance companies, for example, usually furnish their Claim Investigators a company car and the company pays for the upkeep. Or if he drives his own car the company pays him a mileage allowance to cover operating costs. Nor is that all. Company executives realize the importance of the Claim Investigator's work. Most companies segregate him from the noise of the general office—and install him in a private office of his own—with a private secretary.

HOW YOUR EXPENSES ARE PAID

When a Claim Investigator's work takes him away from his office, the company pays his expenses while he is gone. These expenses may cover travel—meals—living at good hotels, and include incidentals such as cab fares, tips and business entertainment. On top of all these "extras" you usually get a liberal sick leave allowance, hospitalization insurance, life insurance, a pension plan and many other benefits the average working man never dreamed of.

And remember that the Claim Investigator's life is filled with new experiences and new interests. No two cases are alike! Each day presents exciting new problems, and back of it all is the deep, inner satisfaction of having solved them fairly, justly.

You Associate with Important People

In this kind of work you meet interesting people, important people, influential people such as lawyers, police officers, judges. Each one is a new adventure. These are the kind of people worth knowing. They are the kind of people who can help you to get ahead faster and those acquaintances often develop into life-long friendships worth far more than financial gain.

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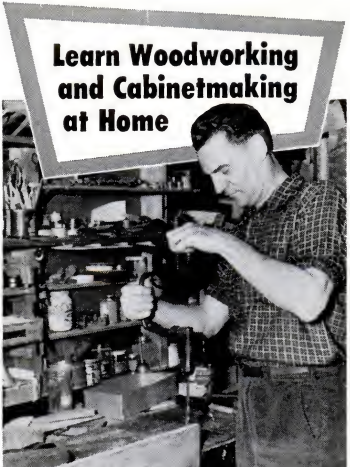

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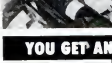

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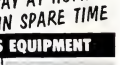

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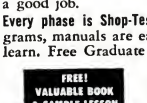

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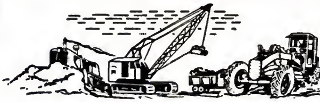

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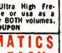

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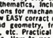

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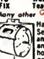

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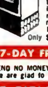

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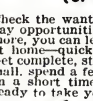

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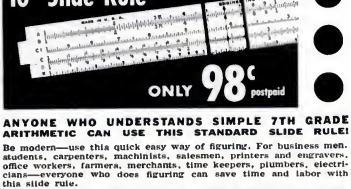

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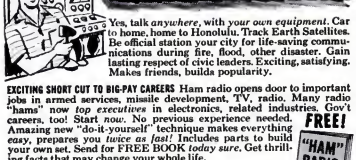

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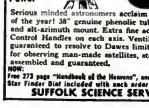

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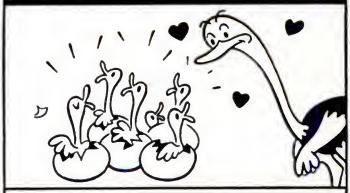

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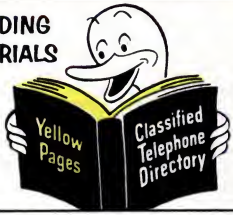

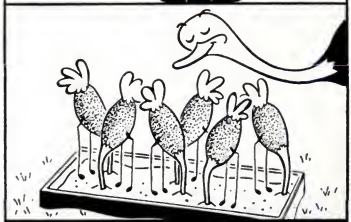

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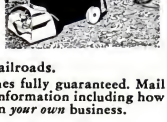

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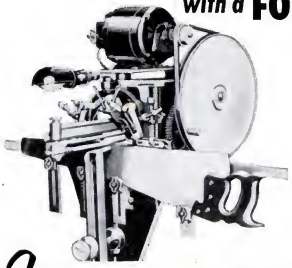

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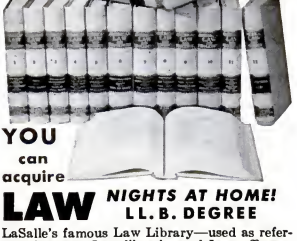

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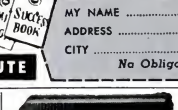

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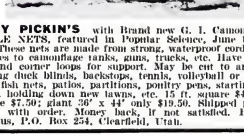

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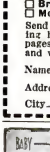

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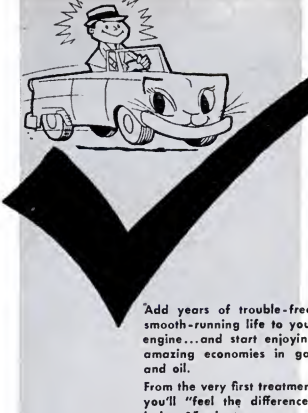

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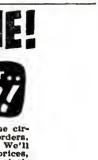

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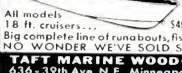

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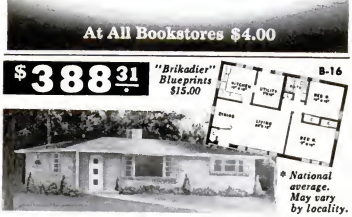

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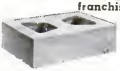

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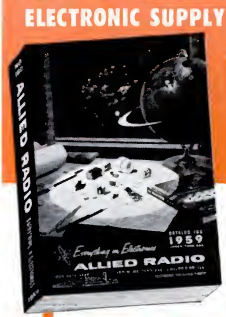

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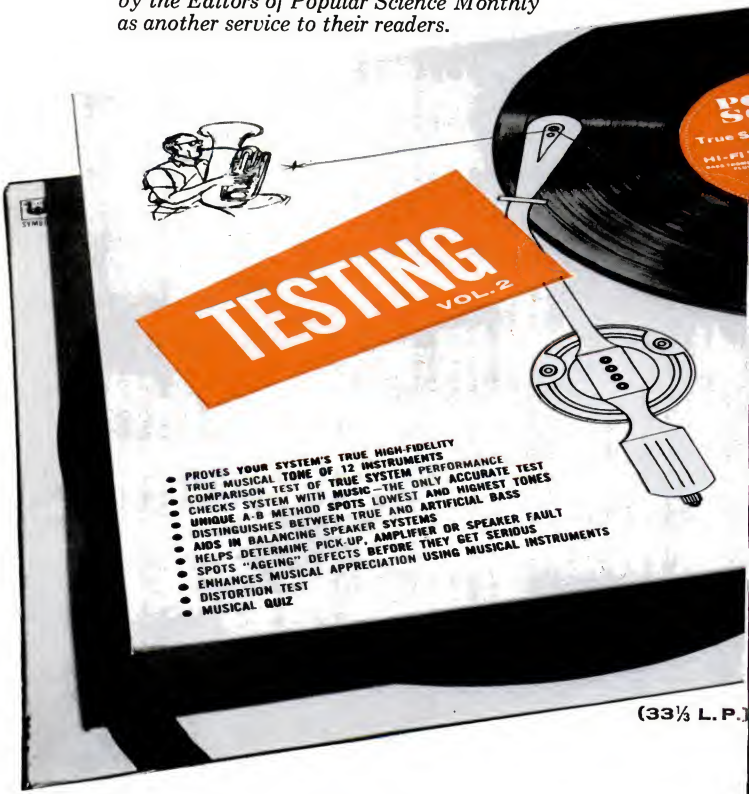

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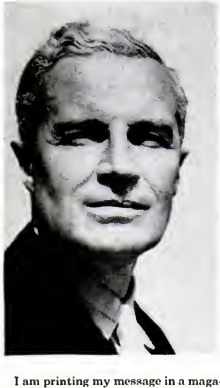

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By Victor B. Mason

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Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things; of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish!* And anyone who tries to tell you that you can *think* your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be *earned!* I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

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Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

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I have a business that is peculiar—one of my businesses. The unusual thing about it is that it is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows". It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that it is within the reach of anyone who has a television set. But it has nothing to do with television.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own". It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turning out a product that has a steady and ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day.

In this message I'm not going to try to tell you the entire story. There is not enough space on this page. And, I am not going to ask you to spend a penny now to learn the secret. I'll send you all the information, free. If you are interested in becoming independent, in becoming your own boss, in knowing the sweet fruits of success as I know them, send me your name. That's all. Just your name. I won't ask you for a penny. I'll send you all the information about one of the most fascinating businesses you can imagine. With these facts, you will make your own investigation. You will check up on conditions in your neighborhood. You will weigh and analyze the whole proposition. Then, and then only, if you decide to take the next step, I'll allow you to invest $15.00. And even then, if you decide that your fifteen dollars has been badly invested I'll return it to you. Don't hesitate to send your name. I have no salesmen. I will merely write you a long letter and send you complete facts about the business I have found to be so successful. After that, you make the decisions.

Does Happiness Hang on Your Decision?

Don't put this off. It may be a coincidence that you are reading these words right now. Or, it may be a matter that is more deeply connected with your destiny than either of us can say. There is only one thing certain: If you have read this far you are interested in the kind of independence I enjoy. And if that is true, then you must take the next step. No coupon on this advertisement. If you don't think enough of your future happiness and prosperity to write your name on a postcard and mail it to me, forget the whole thing. But if you think there is a destiny that shapes men's lives, send your name now. What I send you may convince you of the truth of this proverb. And what I send you will not cost a penny, now or at any other time.

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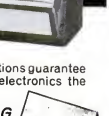

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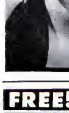

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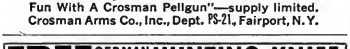

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Over 100,000 Warn Hubs are now in use, *proof* that free-wheeling 2-w.d. with Warn Hubs means big savings in gear, engine, tire wear, gas, *plus* more pep, performance, power in high and easier steering. Now, with Warn Lock-O-matics, you have economical, drag-free 2-w.d. or tractive 4-w.d. *automatically, as you shift!* Ask your *local* 4-w.d. dealer to install Warn Lock-O-matic or Locking Hubs today. Fully guaranteed. Write for free literature.

Models for all 4-w.d. to 1½ tons

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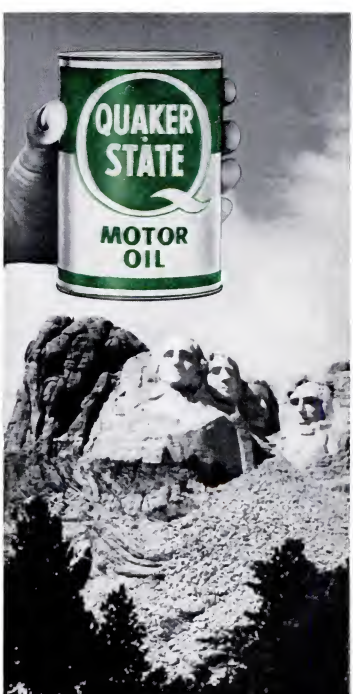


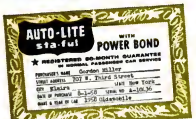
MOUNT RUSHMORE, SOUTH DAKOTA

Big news on the road today is Quaker State. This pure Pennsylvania motor oil is carefully refined to assure longer lasting lubrication in today's high compression engines and keep them running smoother longer. Ask for Quaker State ... *it's the best motor oil money can buy!*

QUAKER STATE OIL REFINING CORPORATION, OIL CITY, PA.
Member Pennsylvania Grade Crude Oil Association

NEW! A battery that eliminates mechanical failure even in the most severe service!

"BREAKDOWN" TEST toughest ever made on batteries! Ordinary battery plates (left) have lost vital power-producing material and failed after only 55 hours of vibration testing. Auto-Lite Sta-ful with Power Bond (right) shows no damage at all after 1000 hours in same test! Plates are still intact and delivering full starting power!



50-MONTH GUARANTEE! Owners of Auto-Lite Sta-ful Batteries with Power Bond receive a 50-month wallet-size Guarantee card. Honored by any Auto-Lite Battery Dealer in the world.

Auto-Lite Sta-ful with Power Bond*... a great new advancement in battery engineering

Power Bond, an exclusive new Auto-Lite development, eliminates a major cause of battery failure . . . plate-destroying vibration. Here's how Power Bond protects full starting power—

1. Power-producing plates, protected by fibre-glass, are firmly *anchored in place* by plastic bonding. Even the most severe service can't shake power-producing material loose.

2. Power Bond construction *eliminates leakage points* found in ordinary batteries. Permanent resin seal bonds top to battery case, fully covers and protects power-conducting intercell connectors. Battery stays sealed and powerful.

3. Rigid *sealed-box construction* gives maximum strength. Over-tight hold-down brackets and extreme under-hood temperatures can't distort case and cause corrosive, power-robbing leakage.

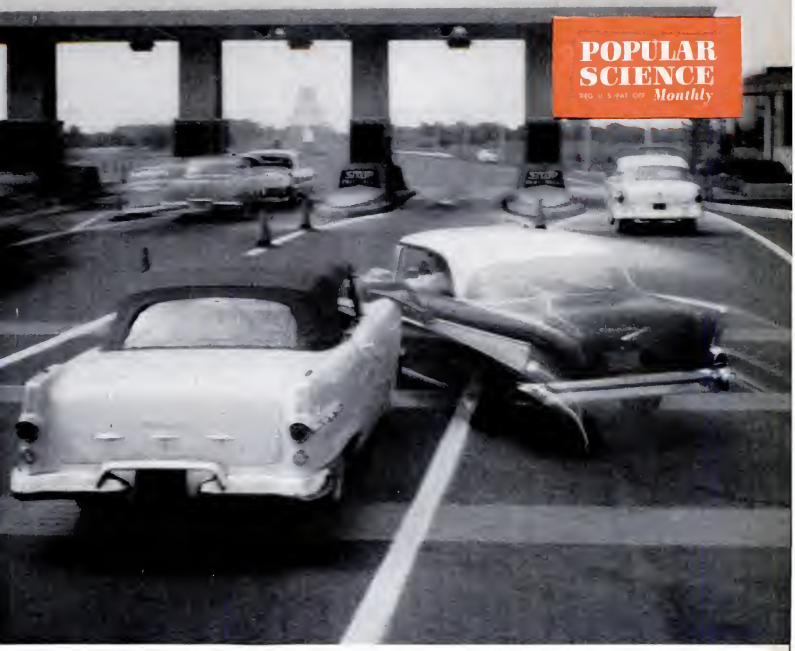
And new Power Bond incorporates the famous Sta-ful extra liquid reserve . . . needs water only 3 times a year in normal car use!

Every Auto-Lite Sta-ful with Power Bond is *registered at the factory by serial number in the owner's name!* Both your Auto-Lite Dealer and the factory stand behind the superior Power Bond Guarantee. Ask for the new Auto-Lite Sta-ful with Power Bond. At Auto-Lite Battery Dealers everywhere.

*PATENT APPLIED FOR

AUTO-LITE® sta-ful WITH POWER BOND

DRY CHARGED... FRESH WHEN YOU BUY! • FOR MOST 12-VOLT SYSTEMS



How to Defend Yourself on the Highway

Here's what police drivers do to stay alive on the job. Their tips could save your life

By Wesley S. Griswold

SUPPOSE you're a highway patrolman, with the daily job of riding herd on all kinds of drivers—good, bad and awful. Day after day, to catch violators, you have to drive as fast as the fastest, take risks with the most reckless, play follow-the-leader in a game whose stakes are your life.

How would you do it—and live?

The life-and-death answers to that question are important to everybody who gets behind a wheel. POPULAR SCIENCE got them by interviewing Commissioner Bernard R. Caldwell of the California Highway Patrol, and by riding with some of his veterans—men with years of accident-free driving under the most hazard-

How would you meet these nine everyday driving emergencies?
Source: Nationwide Mutual Insurance Co.

ous conditions. This crack fleet of law-enforcement drivers has one of the most phenomenal safety records in the country: .19 accidents per 100,000 miles of travel. The national fleet average is 1.51 accidents, eight times as high.

Skill isn't enough, they say, to keep you out of trouble on today's jammed high-speed roads. Many a driver who can double-clutch at 60 and make a slick speed shift is also an accident repeater. Women drivers, less skillful than men, have a lower accident rate.

Nor is rigid obedience to traffic laws any warranty of safety. Accidents happen to drivers who have done nothing wrong. Being legally right is small comfort when you're flat in a hospital bed, and gravestones could be marked in praise of drivers who wound up under them even though they had the right of way.

To be a good driver, say the experts of California's hard-worked Highway Patrol, you must drive not only skillfully and legally, but defensively too. This means, explains Commissioner Caldwell, that his men keep ever aware of traffic all around them, never trust another motorist to do what he should, and expect emergencies. They are vigilant to the booby traps that lurk on every road, familiar or not. Alert to the Indian signs of potential trouble, they can spot an accident in the making as far ahead as they can see.

A booklet on driving for federal law-enforcement officers puts it into five words: Safe Drivers Expect the Worst. The *un*safe driver serenely expects the best. Unprepared for the unexpected, he's as wide open to trouble as a boxer with his arms far apart.

"The fallacy that accidents only happen to others is never allowed to enter my mind," says one California Highway Patrol officer. "It's too dangerous. Every driver should realize that he *can* have an accident unless he prevents it. All patrolmen accept this. It's a mark of professionalism, part of what keeps those

1 GOING DOWN A STEEP HILL, you step on the brakes. They don't work at all. The car goes faster and faster, gaining momentum.

4 CRUISING AT FIFTY, you approach a cross-road. A car shoots out in front of you from the right. You haven't time to stop.

7 ON A FOUR-LANE HIGHWAY, you're in the passing lane approaching an intersection. The car you were about to pass turns left in front of you. There are no other cars near.

2 AT NIGHT, a car with bright lights crests a hill. You flip your beams up and down, but the other driver doesn't dim his.

3 YOU'RE ROLLING AT FORTY on a straight road, with oncoming traffic ahead, when a tire blows out without warning.

5 ON A STRANGE ROAD at night, doing 45, you come without warning to a sharp curve you had no reason to expect.

6 DRIVING ON ICY PAVEMENT, you see a chuck hole ahead and swerve to avoid it. Your car goes into a skid to the right.

8 A BOY ON A BIKE is riding the shoulder of a two-lane road. As you come near, the boy suddenly starts to swerve in front of you. There's no traffic in the other lane.

9 YOU ARE DRIVING on a two-lane highway. A car coming toward you in the opposite lane weaves a little. Then suddenly it swerves into your lane and heads directly at you.

Please turn page for answers to driving-emergencies quiz

eight-to-one accident odds in our favor."

This pinpoints defensive driving as a mental attitude, something between your ears—not in your hands, nerves or eyes, but in your mental outlook. There is only one good thing about a wrong driving attitude, federal experts point out: It can be changed. Tipoffs to bad driving attitudes appear in a column on page 82. They may apply to any driver, of any age, with any amount of experience.

Those California patrolmen have learned to be wary even of the everyday situations all of us face. Here are concrete examples, along with their advice on what you can do to stay out of the statistics:

On city streets

- When stopping behind a car at a light, leave more than a car's length between it and your headlights. Then look in your mirror. If the car coming up behind is not slowing down, pump the brake pedal to flash your stoplights. If that doesn't work, you may need every inch of room in front of you to duck a rear-end crash.
- Never skin through an intersection as the light is changing. Too often the head driver on the cross street picks that moment for a jack-rabbit start.
- Be especially wary at intersections of wide six-lane streets. If two cars are still standing after the light turns green, don't dive through the open lane. The other cars are probably waiting for—and hiding—a pedestrian who hasn't finished crossing. He may reach the open lane just as you do.
- Avoid crossing busy thoroughfares at intersections guarded only by stop signs. This is always hazardous. Learn where there are signals and cross there.
- Don't try to turn left at an intersection where oncoming traffic has bunched up. Go several blocks farther if necessary until you can turn where there is an ample opening in the flow of approaching cars. Better still, turn right and approach the next intersection from the cross street, so avoiding altogether a perilous left turn in heavy traffic.
- Don't trust the other fellow's directional signals. They may still be blinking for a turn already made. Hang back until sure which way he intends to go. Don't depend on what looks like a hand signal, either. He may be flicking a cigarette or checking the weather man.

Answers to DRIVING QUIZ on previous pages
(by a New York University panel of 100 teachers and experts).

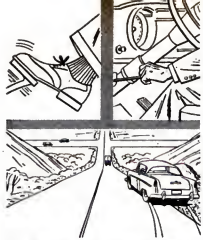
- Never rely on your own directional signals. The chap behind you may assume *you* left them on, or that you're signaling just to be friendly. Use your left hand to signal unmistakably what you're going to do; then, before you do it, look in the rear-view mirror to make sure the driver behind reads you and acts accordingly.
- In passing parked cars, keep an eye peeled for the one that may pull out into your path. Take warning from a puff of exhaust, an out-turned left front wheel, or even someone in the driver's seat.
- A ball bouncing across in front of you? Expect a child to follow it.

On superhighways

- Avoid tailgating like poison, which it is. At expressway speeds, leave six car lengths between yourself and the car ahead when the pavement is dry, 12 car lengths when it's wet. If eager beavers keep muscling in on this open space, forcing you to drop back each time, work over into the slower lane and give yourself a mental medal for easing out of one of the most deadly traffic situations the cops can name.
- If some foolhardy driver persists in tagging close behind, watch for a safe opportunity to pull to the right, out of his way. Think for both of you.
- Never change lanes without first glancing at your rear-view mirror to see what's behind. Then, and only when you have ample room, use both directional and hand signals to show your intention.
- If you want to move from the slow lane into the center lane, first make sure that some car in the inside lane isn't heading across your intended path.
- On four-lane highways with no center dividers, don't pass a car if another is starting to pass in the oncoming two lanes. If both of you pass simultaneously, you'll speed by in opposite directions, an arm's length apart, at a relative speed of about 110 m.p.h.

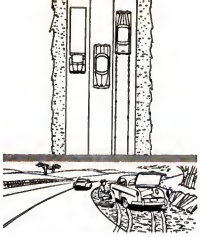
Suppose a tire blows on any of the four cars in the lineup?

- On an expressway, with or without a divider, keep out of the inside lane as

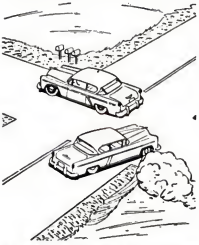


1 PUMP THE BRAKE PEDAL up and down fast. Pull on the emergency brake all the way. Shift into low gear or low drive if you can. Steer over to the side of the road to avoid other traffic.

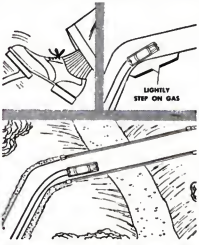
2 DON'T FIGHT HIM with your lights. Use your low beams. Don't look at his lights. Slow down. Look at your edge of the road. Pull over to give the offending driver plenty of room.



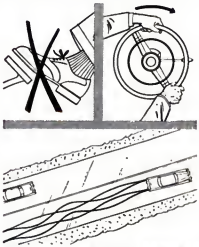
3 DON'T USE THE BRAKES. Get a firm grip on the steering wheel. Hold the car wheels straight. Keep a foot on the gas, but ease up. When slowed down, brake gently. Get entirely off the road.



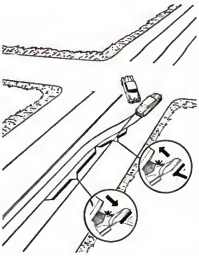
4 BRAKE AT ONCE to reduce speed. Hold the steering wheel straight. At the last possible moment, ease up on the brakes and swerve to the right, cutting behind the other car.



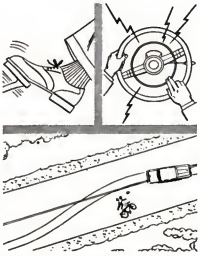
5 BRAKE SEVERAL TIMES. As you round into the curve, step lightly on the gas. If you start to go out of control, keep your foot lightly on the gas and brake with the left. Stay in your lane.



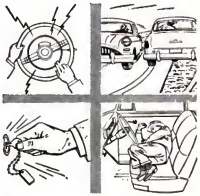
6 DON'T USE THE BRAKES. Turn the steering wheel to the right (whenever possible turn in the direction the rear end is skidding). When the skid stops, slow your car down by gentle braking.



7 BRAKE PROMPTLY as long as practicable. Then ease up on the brakes a little to avoid skidding as you swing the steering wheel hard right, to pull around the rear of the other car.



8 APPLY THE BRAKES. Blow the horn. Steer far to the left, around the bicycle. If the bike is moving too fast or is already well ahead of you, it may be better to swerve to the right of it.



9 IF THERE'S TIME, blow the horn. DON'T pull to the left; he may change lanes. Get both right wheels off the road at once; do not brake unless you must. Leave the road, if necessary.

IF IT'S TOO LATE, cut ignition, lie down away from the wheel, draw your legs up.

Seven Tip-Offs for Rating Driver Attitude

EVERYBODY knows the sober citizen, helpful neighbor and generous friend who becomes an over-age hot-rodder behind the steering wheel—angry, critical, discourteous and inconsiderate. He lets faulty driving attitudes take over. Such authorities as Edward Dougherty, Chief of Operating Facilities of the Treasury Department, and Donald Buck, Assistant Director of Safety in the United States Army, call bad driving attitudes the key to most accidents. Here are typical ones as listed in a pamphlet for the use of law-enforcement officials. If you recognize any in yourself better correct them. Nobody else can.

1. Overconfidence. The cocky driver takes it for granted that his car, road conditions and the actions of others will be right at all times.

2. Minimizing minor scrapes. The belittler sees a fender crease or bumper dent as just one of those things. But the act resulting in such a minor accident *could* cause a serious one.

3. Pride in a no-accident record. This can lead to a rude awakening. A driver's record is up for revision every time his wheels turn.

4. Faith in experience. A series of fortunate escapes may ingrain bad habits. Years of driving carry no immunity.

5. False reliance on guesstimates. Ninety percent, out of hundreds of drivers surveyed, underestimated stopping distances.

6. Self-righteousness. The in-the-right character often tries to punish another driver who, in his opinion, has done something wrong. At best, the other fellow will be merely frightened; if luck goes bad, there's an accident.

7. Impatience. The urge to save seconds suppresses good judgment, and gets the choleric driver into tight situations.

much as possible. You have a better chance to escape being the target of a car that goes out of control on the other side.

- Never slow down without first glancing in the mirror to see how this change of speed might affect the cars behind you. Be sure to get out of a high-speed lane before you start slowing down to leave the expressway.

In fog or heavy rain

- At night, keep your headlights on low-beam position.
- Day or night, avoid sudden stops. Pump your brake to flash following cars an early warning that you are slowing down.
- Stay as far to the right side of the road as you safely can.

Just plain fatigue can make you accident prone. Even the wary driver may change his normally defensive attitude if he's tired out. Don't risk driving long hours day after day; you owe yourself every break possible to cope with unexpected emergencies. Without enough sleep, you're handicapped.

In the course of a day's run, keep both hands on the wheel but move your eyes from side to side often. Staring fixedly at the road makes driving tedious, may bring on fatigue or highway hypnosis. It's good practice to stop for a stretch, every 75 or 100 miles, patrolmen point out, and to change drivers if possible. A switch of seats refreshes you for the next spell at the wheel.

Defensive driving can help keep you in the enviable safety brackets achieved by skilled professionals. It's defensive driving, not their uniforms, driving skill, or superbly maintained automobiles, that patrolmen rate as the most important reason they come home safely after a tour of duty.

"We know we're not superdrivers," one patrolman summed it up. "But by practicing what we preach, having the right attitude, and anticipating the other fellow's actions, we keep the odds in our favor. That's the only way the average individual driver can whittle down the risks now standing against him.

"Good highways, sticking to traffic rules, keeping his car in shape are important helps. But nobody can take his place behind the wheel. *He* has to defend *himself* on the highway." END

A new series to help you get ahead...

TWO MEN walk into a company's employment office. Both are intelligent, personable, neatly dressed. They offer the same level of education, the same experience. They start out at the same job, handle the work with equal competence, and learn equally well.

Ten years later, one of them has inched his way up to a minor supervisory job. **The other is an executive. Why?**

The answer is that this is a complex world. As the more successful man realized, it's no longer enough to work hard, do your job well, learn all you can about your particular field. If you want to climb, you need other skills—skills that aren't, strictly speaking, a part of your job. **You need to know how to handle yourself with people, how to read fast, how to write and talk effectively, how to remember facts and faces.** In short, how to be and advertise yourself as the kind of man who can be given serious responsibility in a rough, complicated world.

A study of 3,800 engineering graduates emphasized the importance of these skills. Asked whether they'd found non-engineering subjects useful, the engineers gave an emphatic "yes." They said they'd found it indispensable to know how to **express their thoughts effectively, and how to get along with people.**

You won't be fired for lacking these skills. Your company may suggest that you learn some of them but it probably won't order you to; nobody will care much, one way or the other, what you do about them. They're strictly your business. **All the same, if you lack one or more of them, you may be passed over when promotions are being handed out, or when you apply for a new job.**

Through years of study and experimentation, most of these outside-the-job skills have been boiled down into fairly exact disciplines. They aren't hard to learn. In this series, POPULAR SCIENCE will show how you can go about picking them up.

How You Can Learn to Read Faster

By Max Gunther and Vance Packard

BUSINESSES big and small have found that it pays to keep everybody informed about what's going on both inside and outside the company. One of the cheapest and most effective ways to do this is through the written word. That's why a mounting torrent of company memos, pep-talk booklets, instruction manuals, technical journals, house organs, and other written matter is probably flowing past you.

You're obliged to read much of this to hold your job. Perhaps you don't have to read all of it—but you'll be wise to if you're counting on a bigger job in the future. Those booklets and journals, unexciting though they may look, weren't turned out for you to set your coffee cup on. Somebody put care and thought into each one, for he felt he had useful information to impart. In those pages are nuggets of wisdom—valuable hints you can use in your climb to higher pay.

That's a lot of reading, you say. True—and there's still more. How about the reading you've been hoping some day to do at home: self-improvement books, textbooks, novels, or a correspondence course?

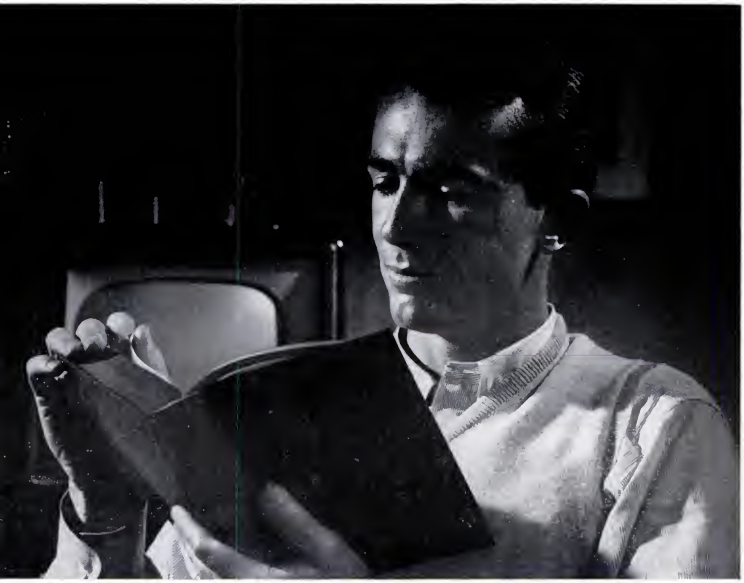
If you despair of finding time, there are two things you should know:

First, almost everybody is in the same boat. Most people had their last formal reading instruction in the sixth grade, and it is at sixth-grade level that most still read. The Dean of the Columbia University Law School remarked a while ago that his students, all college graduates and all men who devour considerably more printed matter than average, are poor readers.

Second, improvement comes easy. In an unbelievably short time, you can double or even triple your reading speed, while at the same time boosting your comprehension. The Reading Institute of New York University, for example, runs a 28-hour course in which most students *double* their speed. Big companies such as General Electric, Continental Can, and International Business Machines have sent thousands of employees to this and other reading clinics, with solid results.

In a massive campaign for faster and better reading, hundreds of Hollywood producers, script readers and others have

No matter how you make your living, it's a safe bet that the amount of on-the-job reading you're required to do has been steadily increasing. It's also a safe bet that you don't read as quickly or efficiently as you could. Surprising as it sounds, almost nobody does. It will pay you to do something about it.



boosted their average speed from 300 words a minute to 800. One producer accelerated by 350 percent; he can now read a novel in an hour.

Can you hope for that kind of improvement? No reason why not. If you choose, you can enroll for a formal course; there's probably a college somewhere near you that has a reading clinic, or a private reading school. Or you can go to the library and pick up any of several good books on the subject. Among them: *Read Faster,* by Dr. Nila B. Smith; *Reading Improvement for Adults,* by Paul D. Leedy.

Or simply teach yourself. There's no real trick to it. Reading improvement is based mainly on two things: 1) reading in bigger takes, and 2) separating the important words from the "noise."

Reading in Bigger Takes

Virtually all reading experts agree that your first job is to increase your "span of recognition." This means, simply, seeing more words at a glance.

A fast reader takes in whole groups of words at a time. A poor reader takes in each word separately. A very poor reader takes his in syllables or even smaller letter-groups. To see the effect on speed, look at the three lines below. According to Dr. Nila Smith, they show how three different readers ploughed through the same passage, and how fast each went:

After / the war he gave t/he fellow a little hou/se on *(1 7/16 seconds)*

Af/ter the war h/e gave the fellow / a little hou/se on *(2 5/8 seconds)*

Af/te/r / t/h/e w/ar h/e g/ave / the / f/ellow / a li/ttl/e h/ou/se / on *(10 7/16 seconds)*

As your first step, check yourself as you read this. If anything moves but your eyes, you're slowing yourself down. If your lips are moving, half-pronouncing the words as you read, you'll never top 250 words a minute. Don't run your finger down the side of the page, and don't let your head move from side to side.

Now get down to the serious business of widening your span. There are many gadgets on the market designed to help you accomplish this, but most experts warn that these gadgets rarely have the almost-magical qualities advertised.

"We use gadgets sparingly," says Dr. Smith. A General Electric brochure adds: "By recognizing that reading is an action of his own, the individual does not make the error of believing that some training device or some 'improvement system' will carry him to success. He can succeed only by developing, by his own practice and effort, a correct pattern of action."

A gadget sometimes helps in the early stages, however, by helping you focus sharply on the kind of improvement you're after. Most span-widening gadgets are designed to flash ever-longer groups of words before your eyes, forcing you to take in more at each glance. You can make your own gadget easily enough: Take three sheets of paper. In one, cut a window a quarter-inch deep and one inch wide; in the second, 1½ inches wide; in the third, two inches.

Now take the one-inch window and move it down the left-hand margin of a printed page. Try to take in all the words on each line immediately as they come into view (including the cut-off beginnings of words at the right-hand edge), without shuttling your eyes back and forth across the window. When you find it easy, move the window down the margin faster. Next, move on to the wider windows.

If you find these exercises a little painful—if you feel rushed and uncomfortable—fine. You're supposed to. "The basic problem with the average reader," says one teacher, "is plain laziness. He reads slowly because it's easy. To speed himself up, he has to use force. Admittedly this hurts, in the beginning."

But the oftener and harder you push, the higher your laziness threshold moves. An exercise that was hard last week comes easy today, for now your cruising speed has increased.

The window system is largely an eye exercise. It helps teach you to gather in more words at a glance, but it does little to boost your comprehension—for you can't reliably comprehend anything, of course, when you read only the left-hand inch or two of each line. To bring comprehension into the picture, experts suggest that you now try this:

Draw a line straight down the middle of a newspaper column. Now read down the column, keeping your eyes focused on the line as steadily as possible. The first

Speed Test

THESE are parts of three exercises from Dr. Nila Smith's book, *Read Faster*. Run your eyes down the center line without shuttling them from side to side, and see how well you can pick up the words and their meaning. You'll probably find the first test easy, the second tougher, and the third—if you're a typical reader—next to impossible. To a trained reader, all three are a snap.

Here is
an idea
for every
young man
who works
for a living.
The worker
gets the
biggest profit
out of
any job
that is
well done.
This profit
is entirely
aside from
the money
that changes
hands.

The farmer will hook
up a pump
with a long pipe
and put that water
where it will
do the most good.
He will no longer
have to look
toward the clouds
and wistfully hope
for the heavens
to spill out
their moisture.

They have eliminated
numerous jolts and twists
but not motion sickness.
Fortunately, engineers are not
the only ones concerned
with this problem.
The traveler of today
has no occasion
to fear motion illness,
for in recent years
chemical investigators
have found useful drugs
that make the passenger
immune to the unpleasantness
that he otherwise
would feel in his stomach.
Outstanding among these drugs
is one called Bonamine,
a unique, long-acting
antimotion sickness compound.

few times, you probably won't get more than the general drift of the news you're reading. But soon you'll find you're seeing more words and picking up more details. When you find it easy, make it hard again by speeding your eyes downward.

Finally, do away with gadgets and lines entirely. By this time, you'll have gained a clear idea of what you're trying to do. From here on, you can practice it on your own, without mechanical help.

Picking Out the Essentials

While you're learning to eat up words in bigger takes, you should also be learning to jump through a sentence so that the important words stand out and the "noise" words merely form a sort of background.

A Harvard authority on reading, Dr. Charles P. Whitlock, put it this way: "The task is to change the thinking habits of readers who have been conditioned by academic educational methods to skip nothing." The fact is, you can usually skip two-thirds of the words in much written material and still get a clear idea of the writer's message. In that last 25-word sentence, for example, there are only eight really essential words: "Can skip two-thirds words, still get message."

Actually, "skip" is not a scrupulously exact description of what the experts mean. Naturally, you have to look at the noise words before you can decide whether they're important. The trick is to push them into the background, like music in a movie. The music is useful; it helps set an emotional tone for the action. But your fullest concentration is on the action.

How do you master this trick? Reading authorities offer four main tools:

1) Before you start reading anything, give it a quick preview to see what it's about and how it's organized. Note headings, sub-headings and other landmarks. This will help you assess the relative importance of words you'll encounter.

2) As you dip into each paragraph, extract the key idea from it. Normally, a paragraph is organized to put across one

[*Continued on page 252*]

Newest version of the giant B-52 and a needle-nosed, stub-tailed missile dubbed Hound Dog make a deadly team

By Wesley S. Griswold

A CURIOUSLY named aerial team of Hound Dog, Green Quail and Stratofortress is forming to extend the reach of the Air Force's striking arm, to multiply its punch and to send a potential enemy off on wild-goose chases at the hour of attack.

The Stratofortress, star performer of this team, is already the free world's defending champion. Far better known by its military name, B-52, it is the mightiest bomber ever built. In an improved model, B-52G, just now emerging from Boeing's cavernous assembly plants at Wichita, it is mightier still. In intimate partnership with the new Hound Dog and Green Quail guided missiles, it will comprise the most deadly and deceptive weapons system in existence.

Nicknamed the "wet wing" bomber, because each of its huge, narrow, machete-shaped wings is a single, great fuel tank, the B-52G has a range impressively larger than the "more than 6,000 miles" officially

Bomber Fires 1,000-Mile Missile

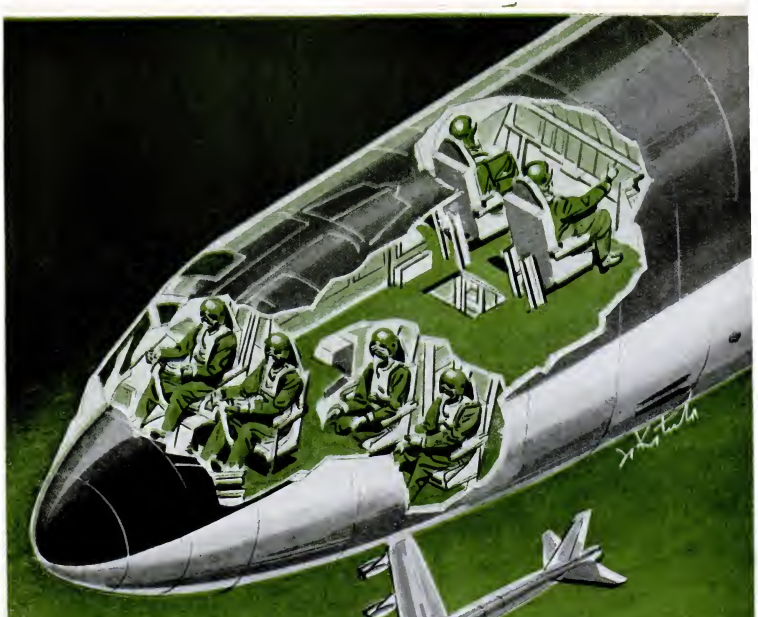
admitted for earlier models of the bomber. With its wet wings, fuselage tanks and wing-tip auxiliary tanks, it is expected to be able to fly 8,500 miles before it needs to rendezvous with a refueling plane.

Gaining extra distance, and boosted speed as well, was more than a matter of finding room for more gallons of JP-4 fuel. In order to reduce drag and weight, the four-story tail, that jaunty trademark of the B-52, has been cut down eight feet in height on the new model. Preliminary tests showed that this could be done without hampering control of the mammoth bomber.

Moving the tail gunner out of the tail and giving him a comfortable seat up front with the rest of the six-man crew achieved smaller savings in weight. This left an eerie man-made eyeball and a television camera to watch the skies to the rear. This shift eliminated the need for pressurizing a tail compartment—the basic weight-saving factor involved.

Moreover, the B-52G has greater power than any of its predecessors. Eight improved J-57 engines, producing more than 12,000 lb. of thrust apiece, will lift it from shorter runways and move it faster and farther than ever before.

But what makes the bomber a more fearful menace than any other plane in the world's skies is the fact that it will



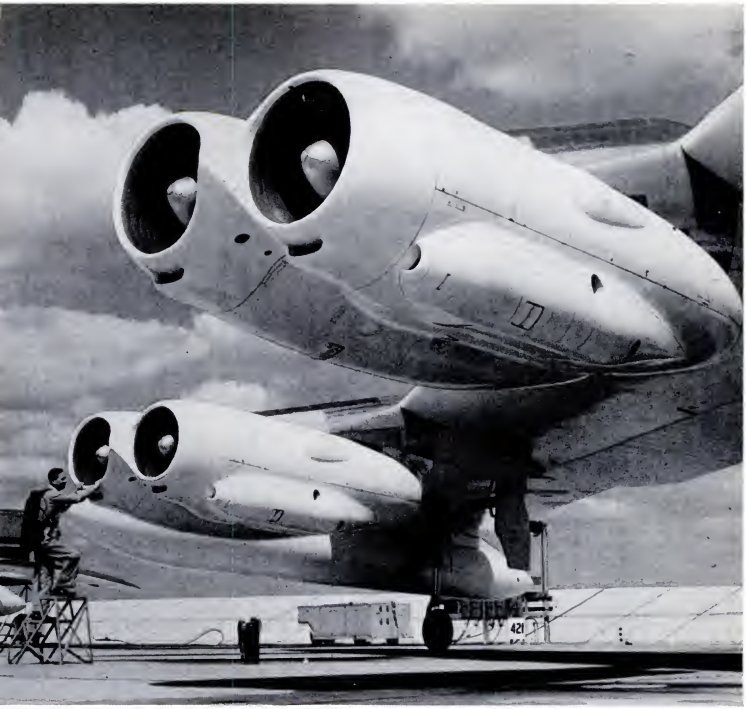
MEN AT WORK: In the nose of the ship, pilot and co-pilot; on lower deck, navigator and bombardier; facing backward, ECM operator—and gunner whose TV eye spots any threat from rear.

soon be taking off on patrol missions with, in effect, two baby bombers slung from those immense wings, which span 185 feet from tip to tip.

Each B-52G can be a flying platform for a pair of Hound Dog missiles with thermonuclear warheads, or it can carry along, in similar wing positions, a couple of Green Quails. The latter, made by McDonnell Aircraft Corp., will contain fantastic electronic-countermeasures equipment instead of explosives. When they spurt from under the shelter of a B-52's wings, they will be able to deceive enemy search radars into reporting droves of approaching planes that aren't there. The Green Quails will lead coveys of enemy anti-missiles and interceptors wildly astray while Hound Dogs and the B-52s themselves fan out and race ahead to destroy the targets they were commanded to obliterate.

Hound Dog, a product of North American Aviation's Missile Division, is almost exactly as long as a T-33 jet training plane—about 38 feet. A slim, needle-pointed missile with a stubby tail and a small vertical stabilizer, it has a delta wing, flaring out near the rear of its fuselage. Thin, short horizontal stabilizers protrude from the sides of its nose.

The missile is powered by a single, air-



MUSCLES FOR A MISSILE BOMBER: Silhouetted against the sky, B-52G's hotted-up turbojets reveal design changes. Humps house alternators for electric current; scoops cool engine oil.

breathing, Pratt & Whitney J-52 engine of 7,500-lb. thrust, with no afterburner. Instead of a plain air scoop, it has a cone-shaped, variable-inlet duct, enabling it to vary its air intake with altitude, for greater efficiency.

The Navy has already run 8,000 hours of tests with the little-known J-52, which will drive Hound Dog at high supersonic speed—Mach 2 or better. The missile's range is astonishing—at least 1,000 miles! That enables the B-52G's bombardier to release a Hound Dog when plane and missile are far beyond reach of enemy radars and fighters. Hound Dog's dazzling range in effect converts the B-52G into a flying IRBM base, almost impossible for an enemy to find.

On each side of the B-52G's body, a Hound Dog will hang from a pylon under the broadest portion of the wing, between the fuselage and the inboard engines.

It will be sprung loose for a mission by explosive bolts, but before it takes off, its engine can be warmed up in flight. This missile, unlike the smaller Rascal [PS, July], uses JP-4 jet fuel only. Fuel lines will run to each Hound Dog, through its pylon, from the bomber's own enormous supply in the wing.

When a Hound Dog flashes away from the mother ship, it can either go off on an

SEALING A "WET WING": Each wing is a single great fuel tank, extending plane's range thousands of miles beyond its predecessors'. All seams, bolts and rivets must be moistureproof.

independent bombing mission hundreds of miles away while the B-52G wheels and heads toward another target, or it can rush ahead of the plane and pulverize enemy defenses, making the bomber's massive destructive errand easier to complete.

The missile's guidance system, a remarkable product of North American's Autonetics Division, is a combination of inertial navigation and star-tracking. The star tracker does its job expertly even by daylight or under cloud cover. Being wholly self-contained, Hound Dog's guidance never blurts out its presence in the sky by radio or radar signal but, instead, silently and continuously consults a memory drum, on which the entire program for its flight is laid out.

In case of a sudden, radioed command to the B-52G to change missions after it has left its base, the programs for the missiles can be altered in flight, too, before the Hound Dogs take off after their own quarries.

Whether a B-52G is tethering a pair of Hound Dogs, and thus becoming a three-in-one bomber, or whether it is toting a brace of Green Quail, it will be exceedingly difficult for an enemy to find and hit.

"It will be very well protected with a revolutionary form of electronic countermeasures," Lt. Gen. C. S. Irvine, a USAF Deputy Chief of Staff, has declared.

This invisible cloak for the bomber is spun from "a bag of tricks never before used in countermeasures," says Norman L. Winter, manager of the Sperry Co., which built the equipment.

If an enemy search radar, probing for intruders, picks up the B-52G in its beams, the bomber's electronic-countermeasures (ECM) apparatus instantly knows it is discovered, and just as quickly jams the alien radar. If enemy antiaircraft missiles or interceptors come whipping up into the stratosphere, their radar eyes fixed on the approaching bomber, the B-52G's electronic guardian senses their stares and promptly blinds them with counter-impulses. Meanwhile, the ECM operator in the bomber's crew sits facing the rear of the plane and his own instrument panel, with little to do but stand by to make adjustments or repairs in case the equipment warns him that it has troubles.

Beside him, also facing rearward and peering into a TV viewing screen, is the rear gunner. Many yards away, high up above the mobile battery of 50-caliber machine guns thrusting from the tail of the B-52G, a basketball-shaped viewing head, an eyeball lens in a big metal socket, gazes unwinkingly below, above, and to left and right of the plane's rear tip.

Behind the curved viewing head is a television camera (the retina of the eyeball), sending a stream of signals through a closed-circuit system that translates them into pictures on the rear gunner's screen. At the touch of a button, he can switch from a broad view of the sky behind to a close-up of a portion of it.

When he sees an inrushing object, he pushes another button. The guns swing to face the attacker and their radar takes over. Relentlessly it focuses them on the target while feeding range and deflection information to them, and, when the target is near enough to kill, signals the rear gunner that the range is right. He jabs a third button, and the guns flash death at the harrier.

This, then, is the mighty new B-52G, a frightening threat to any would-be disturber of the free world's peace. END

It has no springs and no differential, and only Uncle Sam can buy it. But it's fun just to imagine—

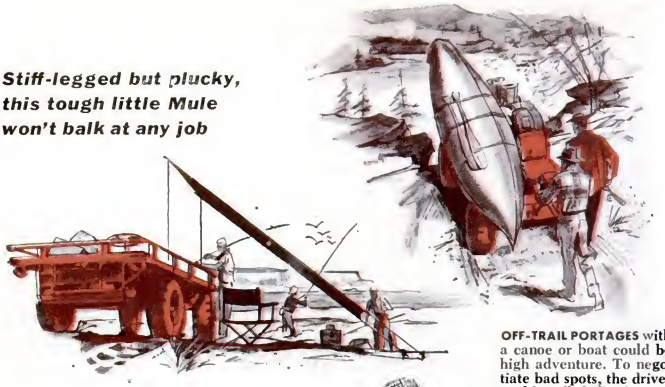
What You Could Do with a Mechanical Mule

IF YOU could get one away from the Quartermasters Corps, you would find plenty of right-around-home uses for the four-wheeled Mechanical Mule. This doughty little vehicle, made by Willys Motors for the Army and Marine Corps, should be just the thing for getting in cordwood, lugging farm equipment to the back forty, setting fence posts, hauling produce off the field, and plowing snow off driveways. Home owner and farmer alike could find a dozen chores for it.

More exciting still is the prospect of heading into the back country with the Mule, to hunt far from beaten trails, pack supplies when you go to make that uranium strike, or haul a boat to isolated waters.

Don't rush out to buy it, though. Willys Motors will tell you to put your money

Stiff-legged but plucky, this tough little Mule won't balk at any job



OFF-TRAIL PORTAGES with a canoe or boat could be high adventure. To negotiate bad spots, the driver could walk behind.

WHEELING ON SAND, the Mule could take surf fishermen to lonely beaches far from roads, with their tackle and camp gear.

ON FARM OR RANGE, the half-tonner could haul fence posts, timbers or concrete blocks right up to the work site.

A-HUNTING YOU COULD GO far afield, even across unbridged streams. The Mule would easily carry three men and supplies.

back in your pocket—the only customer they're selling is Uncle Sam. But they won't mind your looking under the olive drab and seeing what makes this capable little wagon tick. Nor is there any law against dreaming about what you could do with it if . . .

As utilitarian as a wheelbarrow, the M-274 ½-ton weapons carrier is as shrewdly engineered as a missile. It has not a single useless part, not a smidgin of tailfin or fender, no differential, nothing automatic, and only the barest essentials of operator comfort. But it will go just about any place army-booted feet can, and do tricks that would make a Detroit designer's jaw drop. It can, for instance.

- Land hard on its wheels or upside-down, bounce, and drive off unscathed.
- Be driven from a riding, walking or crawling position.
- Ford streams 18 inches deep.
- Climb a 60-percent grade, loaded.
- Carry 1,000 pounds, 100 more than its own weight.
- Run on sand, rocks, or other rough country at speeds up to 25 m.p.h.
- Turn in a 20-foot circle.
- Become a four-wheeled trailer for high-speed road travel.

The stark essentials that make this motorized beast of burden perform so well

are a high-torque pancake engine, a six-speed power train, four-wheel drive, and four-wheel steering.

The engine is air-cooled (no radiator to freeze or be shot full of holes). Except for magneto ignition, it has no electrical system. You start it by pulling a cable up front. Oversquare (2¾″ bore, 2¼″ stroke), it has a 6.5:1 compression ratio, overhead valves, fan cooling, and a governor that limits it to 4,300 r.p.m. Although rated at only 16 horsepower, it packs a lot of torque (40 lb./ft.) on the useful part of the speed curve.

The power train is through a two-speed transfer gear and a conventional three-speed-and-reverse transmission. This gives six forward speeds, with a gait of one m.p.h. in low low.

The four-wheel drive is flat-out and uncompromising. Every wheel is geared to all the rest. You can't spin one on mud or ice; if any wheel has firm footing, you move. But because there are no differentials, tires screech if you turn sharply on a hard road surface, and you have to pour on the gas to overcome wheel friction, scraping some rubber off in the process. On grass, gravel, soil and other off-road surfaces there is enough wheel slip to make the lack of differential action unimportant—dirt flies but you turn on a dime.

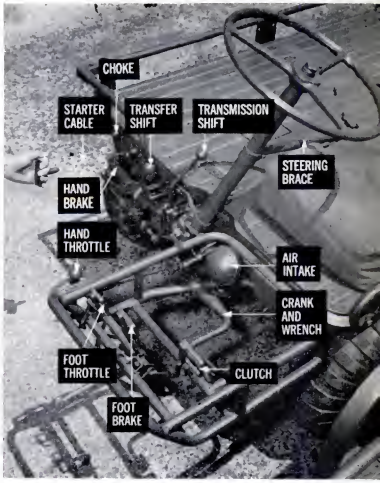
The four-wheel steering is sudden stuff, so quick it would take a sports-car fan by surprise. Hit a rutty road at top speed and you're plenty busy. Since the wheel is offset at an angle, like a one-arm lunchroom chair, you learn to steer on the bias. It works.

Soft, plump tires with only 12 pounds of air in them soak up some of the jolts, but there are enough left to make the ride eventful and occasionally put daylight between you and the driver's seat.

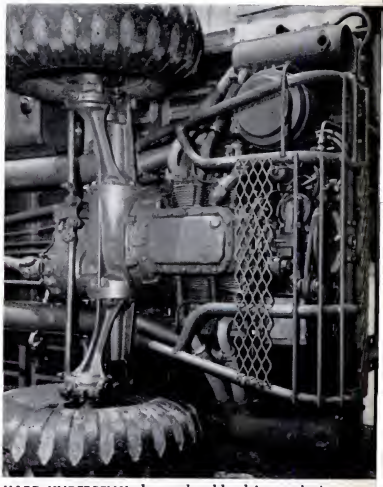
Riding the bed itself (there's only one seat, for the driver) is downright Spartan, but possible. You hang on to the railing around the platform and keep your feet up out of the way of the wheels, which swing out from under on turns.

Hey, Sarge, the bridge is out! Asking no favors in rough country, this tough little utility wagon doesn't mind getting its feet wet.

Suppose a cross-country trek brings you to a pond or stream. The Mule can ford water a foot and a half deep. With its



THE MULE'S BRAINY END: A strut braces the steering wheel. Single seat is for the driver.



HARD UNDERBELLY shows durable drive end. A gearbox at each wheel adds 1:2 reduction.

engine air intake just under your ankles, big tires that afford some flotation, light weight, and power on all four wheels, it can navigate even on soft bottoms.

To drive from the ground, while walking or even crawling behind the vehicle, you unbolt the steering column and lock it in one of two other positions. Then you set the hand throttle, pinch the clutch pedal against the footrest with your right hand, shift into gear, and let in the clutch by uncrimping your fingers. Your left hand controls the hand brake. On a hill, it takes a brand-new set of driving reactions to keep the Mule from rolling back on you—*whoops!* Forget and use a forward gear? Since you're walking at the front end, only reverse must be used, or the Mule will mow you down.

To stop, you pull the hand brake, which seemed to work backward when you drove from the seat (push to set it). From the ground, it works the way you're accustomed to having hand brakes work, which is what Willys had in mind.

To cover roads fast, you can tow the Mule at 50 m.p.h. behind a car, truck or jeep. When detached at your destination, it becomes a mobile self-propelled vehicle instead of a dead trailer.

For towing, you unship the steering column, seat and footrest and stow them under the flat bed. Throttle, brake and clutch cables have quick-release couplings that make all this a two-minute job. The rear wheels lock straight, and the hitch hooks onto the front ones for two-wheel automatic steering, making the Mule a highly roadable trailer.

A new idea in engines, the Mule's was designed to be die-cast of aluminum. Cast-iron liners are shrunk and pinned into the aluminum cylinder block. The flywheel housing, manifolds and many other parts are also of aluminum. Although these are being sand-cast at present, volume production would be done in dies, the castings requiring a minimum of machining. Such an engine might find its way eventually into a small car. Thus the Mechanical Mule might break trail for a different kind of automobile.—*Harry Walton.*

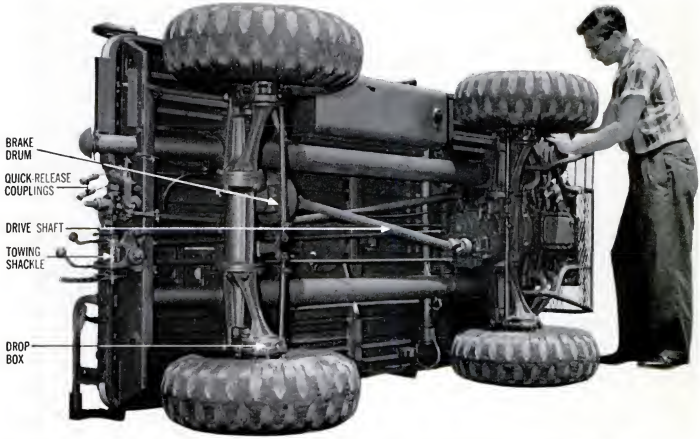
Mule's big brother may someday go on civilian market

Now being tested by the Army, this convertible personnel and cargo carrier is even newer than the Mule—and you may eventually be able to buy it. Fully roadable at up to 60 m.p.h., the still unnamed Willys vehicle will seat six or carry 1,500 pounds of payload. With the spare seats folded flush into the bed, there are 50 square feet of cargo platform.

Powered by a different, much larger pancake engine than the Mule's (164-cu. in. instead of 53, rated at 100 hp.), this vehicle has independent wheel suspension, four-wheel drive, and selective two-

IT'S FOR PEOPLE: Six can ride, on real seats behind a windshield. Rear two face backwards.

. . . AND CARGO, TOO: Payloads up to 1,500 pounds are readily hauled on the platform body.



Nothing bleeds if Mule is flipped on its side; oil, gas stay in. Righted, it's ready to run.

or four-wheel steering. Like the Mule, it will be rugged enough to drop by parachute, sufficiently goat-footed to climb 60-percent grades.

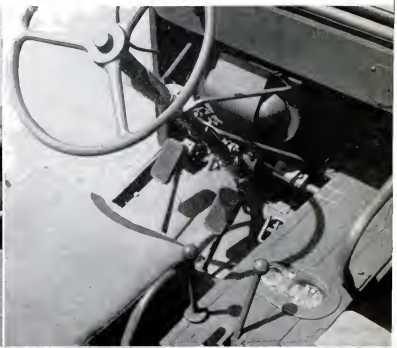
It may even swim. The hull-like body can easily be made watertight, and could be fitted with a propeller driven by a rear power take-off.

Much lighter than the Jeep (1,500 pounds instead of 2,665) the proposed ¾-tonner will turn as sharply as the Mule. It has a full electrical starting and lighting system. A three-speed transmission and transfer shift give it six forward and two reverse speeds.

The manufacturers see it as having potential civilian uses for farmers, sportsmen, airport and factory workers.

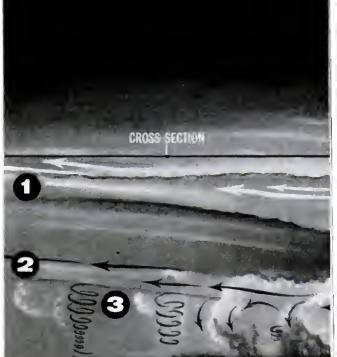
SEATS FOLD FLUSH into the floor to make flat cargo deck. Well accommodates rider's feet.

PLAIN DASH has no instruments; they're on floor hump. The extra lever shifts the transfer gear.



What Science Is Discovering About Hurricanes

By Ernst Behrendt



1. Lesser winds at 40,000 ft.
2. Primary winds at 20,000 ft.
3. False eyes (eddies inside storm)
4. Wobbling path of hurricane
5. Bands of rain

We are closing in on the killer storms. Will we learn to spot them sooner—even meet them and knock them out?

TO LICK an enemy you must know his strength and what makes him tick. This is the vital intelligence work our weathermen are now doing on hurricanes. It's a task of unprecedented magnitude, a David-and-Goliath tale brought up to date.

For, despite our complacent mastery of the atom, the power of a tropical storm contemptuously puts us in our place. A hurricane releases twice the energy of a Hiroshima-type bomb every second, and it may last 10 days, or 864,000 seconds.

Such a storm may cover an area the size of one of our Western states—and reach to a height of eight miles. It will suck in three billion tons of air a minute. It can dump 30 billion tons of water over the countryside—2½ times the amount penned behind Grand Coulee dam.

More men and equipment are being thrown into hurricane research this season than ever before. With three years of intensified effort behind them and a number of new devices ready for action right now, weathermen are willing to venture these predictions:

- Many of the hurricane's secrets will soon be discovered.
- Hurricane forecasting will become more precise.
- There is at least hope for ultimate

Hurricane Facts

- More hurricanes occur in September than in any other month.
- The hurricane season usually starts around Aug. 10; but in some years the first hurricane of the season has been recorded as early as May 15, the last as late as Dec. 30.
- A hurricane's average life expectancy is nine days. July and November hurricanes usually last about eight days, August hurricanes 12 days.
- The forward speed of a hurricane averages less than 12 m.p.h. However, the famous September, 1938, hurricane and "Carol" of 1954 hit 50 to 56 m.p.h.
- More than three-fourths of all hurricane victims are killed by drowning. The hurricane surge may increase the ocean

LOOKING A HURRICANE IN THE EYE: Drawing shows basic components of its titanic "engine." Much larger than previously thought, the storm may blanket an area of 250,000 square miles, release forces far greater than a nuclear blast. What actually triggers it is still not known.

control by man of these violent storms.

This doesn't mean that the big blows are on their way out. Hurricane Diane of 1955, history's first billion-dollar storm, may be followed by others equally expensive. The tragedy of Cameron, La., where Hurricane Audrey killed hundreds in 1957, could be duplicated this year or next.

But talk to the men of the U. S. Weather Bureau and you will find an impressive change of mood. "We don't feel quite as helpless as before," says a meteorologist. "Then we were fighting in the dark. Now we're beginning to see the thing."

What does the "thing" really look like? What have scientists learned about hurricanes so far? Here are the high spots:

They are even bigger than once thought. It had long been known that large ones could blanket a monumental piece of real estate—up to 500 miles long and as wide. But it was believed that the vicious hurricane winds, blowing up at 150 m.p.h. with gusts probably exceeding 200, calmed down a few thousand feet up. Now there's proof that things can be even livelier upstairs. Some hurricane winds have been found to rage with undiminished fury at 20,000 feet and higher.

This means a brand-new concept of the energy distributed inside the hurricane "engine." Meteorologists now know where to look for clues to this giant mechanism: up. Most promising hunting ground is the hurricane's "middle level" up to 30,000 feet.

Each storm is unique. Hurricanes are

tide by 15 to 20 feet; and the surge itself is usually topped by enormous waves.

- 6,000 people were killed in the Galveston hurricane of 1900; the toll of the 1928 hurricane of Lake Okeechobee was 1836 killed and 1870 injured.
- Although the frequency of hurricanes has reached about 10 a year (it used to be five to seven in former decades) weathermen doubt that hurricanes are generally on the increase. There were no hurricanes in 1907 and 1914.
- Engineers have estimated the speed of some hurricane winds at up to 250 m.p.h.
- The lowest barometric pressure ever recorded during a hurricane was 26.35 inches (892 millibars) at Long Key, Fla. The record for rainfall was established at Taylor, Tex., in September, 1921: 23.11 inches in 24 hours.

What to Do Before the Hurricane Strikes

1. Keep radio or television on at all times.
2. Get away from beaches and from areas where streams may flood. If passage to high ground is over a road likely to be under water, leave early.
3. If your house is well built and out of danger from high tides, stay inside. Be sure a door or window can be opened on the side opposite that facing the wind.
4. Put on storm shutters, board up, tape or otherwise protect all windows.
5. Store plenty of food that will require no refrigeration or cooking.
6. Sterilize bathtub, jugs, bottles, pots, etc., and fill with drinking water.
7. Have flashlights handy.
8. Have your car gassed up.
9. Secure everything that might blow away or be torn loose, such as garbage

now discovered to be startlingly different from one another—there is no typical one. "They're as unique as human fingerprints," says a spokesman for the Weather Bureau.

Some shove heavy rain squalls ahead of them; others bring downpours in their wakes. Some seem to stop before an invisible red light and mill around in the same area for days; others race ahead or swerve wildly about. A few even go into reverse. A hurricane's center or "eye" may be sunnily serene, may shrink or expand, or turn into a choppy vortex with a heavy overcast known as a hub cloud. Some hurricanes have had two eyes. Wind velocities in them range from zephyr-soft to incredibly high.

All this makes weathermen realize that they'll have to study at least 40 or 50 hurricanes to get enough clues to begin to understand them.

The huge twisters wobble. It has been discovered only recently that, for hurricanes, the straight and narrow path is an exception. As the storm moves forward, its center often shifts sidewise by 10 or 20 miles.

This discovery of wobble is very important. Because a storm's fury is usually concentrated near its center, special warnings are issued to communities directly in the center's path. But a 20-mile wobble will throw predictions off course and endanger thousands of lives.

Weathermen now know how vital it is to track the center, but they still argue about what the center is. The radar eye? The wind eye? The spot where barometric pressure is lowest? A workable definition is still needed, for as the center goes, so goes the storm.

Hurricanes have layers. Recent research has exploded the popular picture of a hurricane as a gigantic spinning top. It does spin, but comparing it to a rotating witch's cauldron would be closer to the facts.

The hurricane cauldron may have tremendous holes in its sides. Masses of air, sucked into the system, blow right through these and out the other side. The old spinning-top idea was that whatever got into a hurricane would stay inside, that 90 percent of the air in it would switch around and around for days.

But—and this is one of the most surprising discoveries so far—hurricanes seem to be made up of spiral bands. Each band is loaded with its own kind of hurricane weather. There may be wind gales and downpours in one band, then only relatively minor disturbances until you come to the next band with even stronger gales, and so on. These findings scotch two other old notions; they show that winds do not increase in strength at a more or less uniform rate toward the center, and that the winds do not blow in circles.

But scientists are still far from satisfied. So far they've raised more questions than they can answer. Large chunks of the hurricane jigsaw puzzle are still missing. For instance:

What triggers a hurricane? This is the question most on the experts' minds. Hurricanes are spawned in the doldrums—a region off West Africa that sometimes reaches across the Atlantic into the Caribbean. They form under special conditions: The water must be at a temperature of at least 80 degrees Fahrenheit, and the steady flow of easterly trade winds must have been upset by some disturbance. During the hurricane season these conditions seem to occur about once every four days.

But hurricanes don't form that often, so weathermen reason that a crucial ele-

cans, garden tools, toys, signs, porch furniture, etc.

10. Stay in a safe place even if the "eye" is directly overhead. The wind will return suddenly from the opposite direction.

. . . After the Hurricane

1. Seek medical care for the injured.
2. Don't touch loose or dangling wires. Report them to power company or police.
3. Report broken water and sewer mains to the water department.
4. Guard against spoiled food in refrigerators if power has been off.
5. Unless qualified to help, stay away from disaster areas.
6. Drive most carefully. Streets are likely to be filled with debris; weakened pavement may collapse under the weight of your car.
7. Prevent fires. Lowered water pressure interferes with firefighting after a hurricane.

ment is still missing from the picture puzzle. They are still looking for the trigger. One of the leading suspects of the moment is a peculiar air-flow pattern that sometimes develops at 40,000 feet—an outward flow of air masses from a common center that creates an updraft.

If convicted of triggering hurricanes, this phenomenon would become one of the weathermen's prime targets.

What way will a hurricane go? This is a vital question to millions in a killer storm's path. Meteorologists now believe that two factors control the route of a tropical storm, one outside, the other inside the hurricane itself. The outside factor is the so-called steering current—a river of air that carries the hurricane as flowing water does a swimmer. Inside is the thrashing power of the storm, which can kick itself in undetermined directions.

Weathermen say that their knowledge of a hurricane's internal dynamics is still too scanty to predict its path with certainty, but they believe that five years of probing should provide most of the answers. Since May, 1956, when the National Hurricane Research Project really got under way, a record number of men and machines have been getting more facts.

The project now puts three planes, at different levels, inside the same hurricane at once—a B-47 and two B-50s. The planes are loaded with half a million dollars' worth of the most advanced instruments. They record several thousand measurements per minute—a hundred times more than can be taken by the Navy and Air Force planes called hurricane hunters. This fantastic amount of data is all recorded on punch cards and fed into a computer. The computer will come up with the most comprehensive X-rays of a hurricane's innards ever taken. Other devices already in use or coming are:

- Hurricane beacons. These consist of a balloon, a helium flask and a radio transmitter all packed in a container. A plane drops the container into a hurricane center at 15,000 feet. Its fall slowed by a parachute, the container opens and the balloon is automatically inflated, where-

[Continued on page 264]

How Hurricanes Get Their Names

NAMING hurricanes after girls is a recent custom. For several hundred years the storms used to be named after saints; there were, for instance, the famous "Hurricane Santa Ana" of 1825, "San Felipe I" of 1876 and "San Felipe II" of 1928. In the long run this tended to be confusing. Hurricane names should be short, clearly pronounced, quickly recognized and easily remembered. Saints' names did not qualify; neither do most of the other systems that have been suggested: Greek gods, military alphabets (Able-Baker-Charlie, etc.), adjectives (Awful-Bad-Churning, etc.) or animals.

Probably the first hurricane with a girl's name was "Maria," the heroine of "Storm" by George R. Stewart.

Today, hurricanes are named by Weather Bureau, Air Force and Navy.

Here is the list of 1958 hurricanes in the Gulf of Mexico, Caribbean, and Atlantic: Alma, Becky, Cleo, Daisy, Ella, Fifi, Gerda, Helene, Ilsa, Janice, Katy, Lila, Milly, Nola, Orchid, Portia, Queeny, Rena, Sherry, Thora, Udele, Virgy, Wilna, Xrae, Yurith, Zorna.

Window on Tomorrow

ATOMIC PEACETIME

By adapting nuclear bombs to engineering uses, bold new ways to dig harbors and canals,

A MUSHROOM cloud rising over the rugged coast of Alaska, north of the Arctic Circle, may herald our first peaceful application of nuclear bombs.

The Atomic Energy Commission announces that it will excavate a harbor between Cape Seppings and Cape Thompson with "nuclear explosives," probably in 1960, if the project's feasibility and safety is confirmed by survey parties now at the spot. Created as instantaneously as if by waving a magic wand, the port will tap the mineral wealth of northernmost Alaska, and offer fishing fleets a haven.

Most significant of all, it will inaugurate an era of grand-scale engineering with atomic explosions. According to Dr. Willard F. Libby, AEC commissioner, these things are in the cards:

A-blasts will mine ore now inaccessible, and recover oil locked in shale. Subterranean atomic bombs will drive electric power plants. Underground reservoirs dug with nuclear bombs will make deserts bloom. And the atom's mighty power will make child's play of colossal earth-moving feats, to dig harbors, dredge channels, and build great canals.

To bring about such peaceful uses of nuclear bombs as these, a breath-taking AEC program called Project Plowshare got under way early last year, at the University of California Radiation Laboratory

 No. 2 in a series of articles exploring the frontiers of science

BLASTING FOR FEATS

BY ALDEN P. ARMAGNAC

an adventurous U.S. project promises reclaim deserts, mine ore, and generate power

in Livermore, Cal., under the co-direction of Dr. Gerald W. Johnson and Dr. Harold Brown.

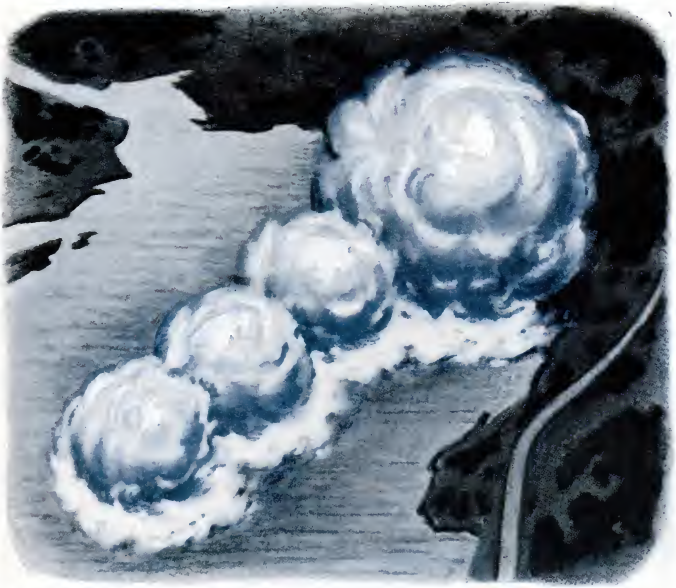
"In considering possible tasks, the imagination is free to explore projects hundreds or thousands of times larger than have ever been undertaken," says Dr. Johnson. And other undertakings, technically possible but too costly at present, will become economically feasible. For, surprisingly, atomic explosives are far cheaper than dynamite or TNT—per unit of energy, or per cubic yard of earth moved.

Atomic blasting was envisioned at least as early as 1947, when the "father of the A-bomb," Dr. J. Robert Oppenheimer, told the United Nations of its possibilities. "We know we can make harbors," declared Dr. Libby more recently, pointing to the awesome craters of multi-megaton H-bombs tested in the Pacific. But until lately, there seemed an insuperable obstacle to adapting nuclear weapons for benign purposes—their dangerous radioactive fallout.

Two momentous developments have now changed that view and made peaceful bombs the big news in coming AEC plans. One is the promise of recent and continuing advances in "clean" nuclear bombs, with drastically reduced fallout. The other is discovery of a way to set off an A-bomb with no fallout at all, demonstrated in Nevada last year by the deep-underground "Rainier" bomb test.

The Alaskan atomic harbor will be part of Project Plowshare. The

On the earth's surface and far below it, peaceful



Excavating a harbor with nuclear explosives, as projected in Alaska, may be first U. S. use of nuclear bombs for peace. A big H-blast forms a harbor, and three smaller bombs dig an approach channel, in typical plan envisioned by AEC's Project Plowshare. Number and pattern of bombs may be varied to suit Alaskan and other sites.

surprise announcement of it, which the AEC declined to amplify, said nothing of the method to be used. But if the operation follows known Plowshare ideas, this is how it will be done:

One large bomb will dig a crater at the shoreline to form the harbor itself. The overlapping craters of three smaller bombs, fired simultaneously with it, will make an approach channel skirting the shore or extending straight out to sea. This general plan of course may be varied to suit the topography of the chosen site.

An H-bomb of possibly several megatons, used for the main blast, would yield a harbor of useful size. An AEC bomb handbook shows that a crater about 1,000 feet in diameter and 110 feet deep will be dug in hard rock by the surface explosion of a one-megaton H-bomb, equivalent to a million tons of TNT. A shallow underground blast of the same size, or a larger surface blast, would increase those dimensions.

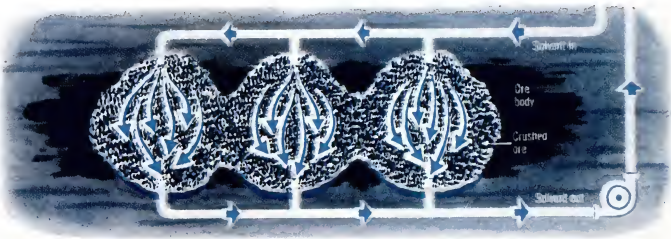
Using the cleanest available type of bomb would be desirable to reduce the usually heavy fallout of surface or near-surface nuclear blasts. The major part of any noticeable fallout will descend, downwind, within about 200 miles of the site.

"Hottest" after the detonation, radioactively, will be the harbor-forming crater itself. (Even a 100-percent-clean bomb would induce a little radioactivity, for a time, in nearby earth or rock.) But the crater will immediately be inundated, and

nuclear bombs will bring about things like these

"Aquifers"—underground reservoirs—carved by explosion and cave-in beneath dry stream bed, will irrigate parched regions by catching water that would otherwise evaporate.

Power plant generating up to 1,000,000 kilowatts can harness heat of A-bombs, exploded alternately in two deep-underground cavities that serve as boilers to make steam.



Mining with A-bombs will apply their demonstrated ability to crush enormous quantity of rock. Exploded far underground, bombs will pulverize an ore body. Then valuable metals can be extracted by a leaching solution without need of hoisting the ore to the surface. Rich deep-lying veins, inaccessible at present, can be tapped this way.

partly submerged, by the sea. Tides, washing in and out, will speed the gradual dying-down of the radioactivity by carrying some away. Within several months at most, it should be safe to enter and use the harbor.

Foreign observers, says the AEC, will be invited to watch the blast create the Alaskan port. (In contrast, while Russia has claimed engineering feats with atomic explosives, no Western observer has seen them, and the AEC lacks any evidence confirming them.) Canada and Russia have been informed of the preliminary field studies at the Alaskan site.

Our past megaton-range bomb trials have been confined to our ocean-surrounded test site in the far Pacific. Apparently we now have, or expect to have by 1960, big bombs clean enough to be fired on the North American mainland. Could they be used in more populous regions than the remote Alaskan-harbor site? Just this much was known:

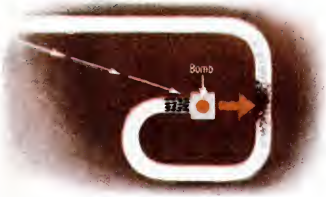
The U. S. had bombs that were 96-percent clean, as of mid-'57. Nearly half our 1958 bomb tests in the Pacific were being devoted to improving upon them. As this was written, foreign observers were being invited to an early "laboratory demonstration" of our clean-bomb progress, which might be the occasion for revealing more.

By various means, either obvious (like increasing the fusion-to-fission ratio) or only hinted at (like the AEC's still-mysterious Fireball Chemistry Project), U. S.

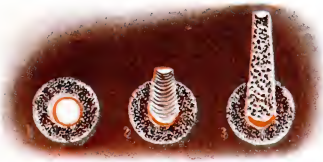
experimenters seemed near, at least, to perfecting bombs clean enough to be used anywhere—for peaceful as well as military ends.

Once that has been accomplished—if it has not quite been, yet—we can expect to see the evolution of gigantic engineering works. Their hallmark will be the distinctive shape of their basic element, the paraboloid bomb crater, with an elevated rim like that of a crater on the moon.

What happened inside the mountain when "Rainier" A-bomb went off



A-blast trapped itself by sealing tunnel (arrow). Starting 200 feet away, drillers and tunnelers later probed bomb zone (light arrows).



Blast made huge cavity (1). Glass bubble, lining it, broke (2) and cave-in enlarged cavity (3). Locked-up fallout was found at bottom (colored zone).

A great canal, say, will be formed by a long chain of these overlapping pits, stretching as far as the eye can see.

Meanwhile an experiment that made a mountain leap has pointed out a shortcut to harnessing A-blasts.

On September 19, 1957, the AEC set off an A-bomb inside a Nevada mesa. The original purpose, to see if weapons tests could be made without fallout, had grown into a crucial test of embryonic Plowshare schemes.

An ingenious self-sealing tunnel penetrated the mesa's side, extended horizontally 1,600 feet inward, curved back almost upon itself, and ended in a six-by-six-by-seven-foot room. In this the bomb was placed, 900 feet below the mesa top, and sandbags closed the chamber's entrance. The bomb's explosion, it was correctly predicted, would ram rock into the opposite leg of the tunnel and trap the blast. So unknown were the consequences that the experimenters cautiously chose almost the smallest A-bomb there is. It had a power of 1.7 kilotons, the equivalent of 1,700 tons of TNT.

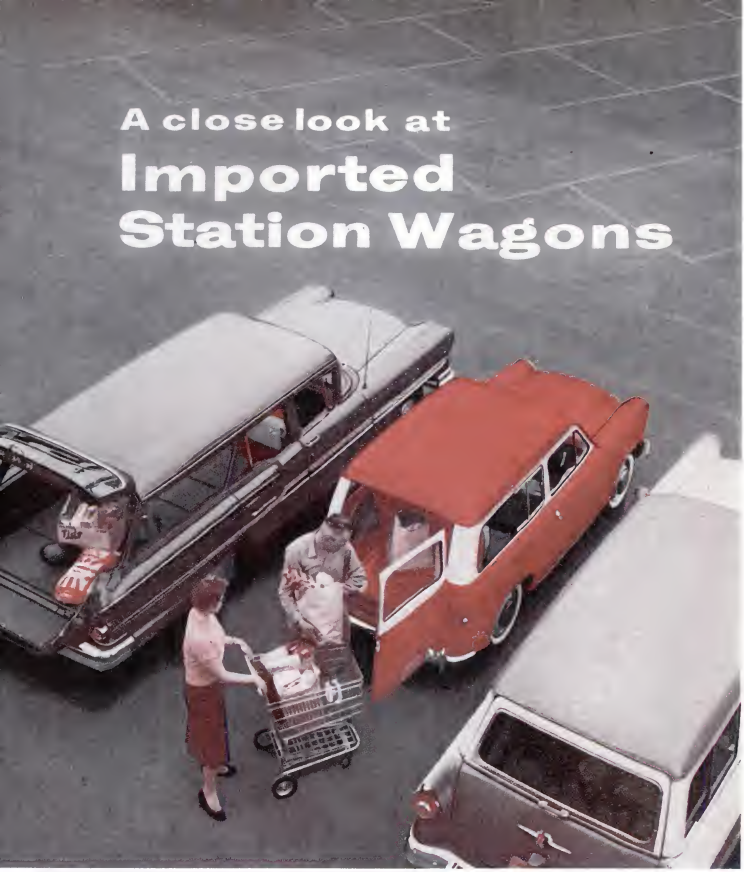
From 2½ miles away, observers witnessed as strange a spectacle as the Nevada Test Site has ever seen. They saw a ripple travel up the mountain's face. Spurts of dust flew from the top, which jumped a foot and then settled back. The sound of a muffled explosion reached the spectators—but there was no visible flash, no mushroom cloud. When white-garbed men with radiation meters searched for fallout radioactivity, they found none—not even in the bomb tunnel, still passable up to a point 200 feet from the blast, where it had collapsed.

To learn what had happened deep in the mesa, drillers probed it from top and side. By last May, sweating tunnelers, toiling in 110-degree heat and virtually 100-percent humidity, had driven a new shaft to the outskirts of the bomb zone. Some had wondered if they'd find precious gems, formed by the heat and pressure. They didn't. What they did find, even more exciting to the Plowshare planners, is revealed in a 27-page report just published by the AEC:

For a cataclysmic moment, the inside of the mountain became the crucible for an awe-inspiring experiment in astrophysics. A fireball of stellar temperature, building up a fantastic pressure of 6,000,000 atmospheres, hurled back its prison walls. It stretched them into a 110-foot spherical cavity lined with a four-inch-thick "bubble" of molten lava—whose drippings formed little rock "icicles" found later. When the mountain would yield no more, the bomb's energy escaped into the rock as heat, and the lava bubble congealed, becoming solid and glassy. Then, probably within a few minutes as pressure within it dropped, the glass bubble collapsed like a crushed egg-

[Continued on page 254]

A close look at Imported Station Wagons



Small outside, big inside, they challenge U. S. wagons by packing surprisingly large loads into pint-size containers

By Harry Walton

IF THERE was one slice of the auto market Detroit thought its very own, it was station-wagon sales. A wagon has to be roomy. How could those pint-sized imports even begin to compete?

But they have. Today the U. S. buyer shopping around for a new car is exposed to a whole fleet of offbeat passenger-cargo carriers. Next question: Will the current acceptance of economy cars extend to scaled-down wagons?

The station-wagon design is as American as Yankee Doodle. But European auto makers have redimensioned it in centimeters instead of inches, put an efficient little engine under the hood, and

Hillman Husky Bargain-priced English two-door—deceptively small beside U.S. wagon—is fairly roomy inside. Rear door pops open at touch of a button. It comes with air conditioning for only $375 extra.

sent us a product of considerable charm and economy, with load capacities ranging from modest to immense.

What's new about these foreign wagons is the big proportion of cargo space to overall size. The builders nurse dimensions with the loving care an accountant gives his own tax return. They ration fuel with small engines to move a whopping amount of payload per gallon of gas.

Not being magicians, they've had to sacrifice some things we like in American wagons. Only the higher-priced, middle-size imports will double as trucks on Saturday and family sedans on Sunday the way ours do.

Both the smaller and the larger ones lack the long-range comfort at sustained high speed that we like for turnpike cruising and vacation trips. Compared to American wagons, the economy-powered ones are short on acceleration and hill-climbing ability, more vulnerable to headwinds.

The European family bus, for which no American equivalent exists, may get you hailed at street corners by near-sighted shoppers. It is also hard on the sacro-iliac. A wife, face to face with one on the showroom floor, is apt to fold her arms and ominously tap the floor with one foot, for it resembles a delivery van rather than an automobile.

Despite these drawbacks, the overseas wagons make sense. Even the small ones have all the cargo space the average home owner needs 90 percent of the time—though he may have to leave the family

Fiat Family Sedan

Trim Italian station wagon has four side doors and a big rear door. With the back seat down, it affords 16 square feet of cargo space. The four-cylinder OHV engine has down-draft carburetion. There is a four-speed steering-column shift and, as standard equipment, the car has a heater, windshield washer and turn signals.

Simca Chatelaine Brisk-mannered and easy to drive, this two-door wagon from France handles well both in town and country, is good transportation value for work or play. Dropped tailgate accommodates long loads (left).

at home when hauling maximum loads. The "big" imported wagons, still small by U. S. standards, have useful cargo space even with all seats in use. They are also eye-pleasing, if you don't insist on being blinded by chrome.

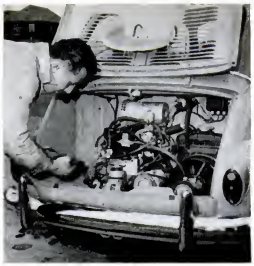
The at-first-glance awkward bus wagons have exciting possibilities for low-cost touring, camp-out, fishing and hunting trips. This breed seats six to 12 passengers, runs 25 miles or more on a gallon of gas, and can double as a moving van if need be.

It can also haul all the lumber for a summer cabin at one time, including plywood panels. The mystery is where it holds all this, for if you run one alongside one of our wagons, you find it's two to three *feet* shorter.

Economy-size wagons start at $1,639 with the Hillman Husky. (All prices given are what you'd pay at New York Port of Entry.) The Husky, a lively four-seater with a short-stroke 8:1-compression engine, demands little shifting even on hills, parks on a devaluated dime, and can hold a brisk pace both in city traffic and on the open road. It has a unitized body and frame. A wide-swinging rear door facilitates loading, though it sacrifices the extra load length of the dropped tailgate.

The Hillman's finish is good, its interior respectable though hardly luxurious. Leg room seems skimpy; the gas-pedal position could prove tiring. Side windows are hard to slide and the pop-open spring on the back door should be livelier. Door

DKW Universal Dwarfed by its radiator, a lively three-cylinder engine (under fan, left) in this German quality car runs on a 1:40 oil-gas mix. For reliable high-rev ignition, each cylinder has its own coil.



Fiat Multipla Snub-nosed and capable, this six-passenger bus can turn in a 28-foot circle. The rear-mounted 39-cu.-in. engine runs it 35 miles on a gallon of gas. Handling is easy, roadability excellent.

handles can be worked with either hand and — who knows? — someday Hillman may get around to putting a door lock on the left side.

Charmingly French is the Simca Chatelaine, which also carries four plus baggage, or two if you drop the rear seat to use the 55-inch-long cargo space. With the tailgate down, it's no trick to carry seven-foot-long loads.

The Simca's styling is *tres chic*, although it looks better from outside than from within. Its standard equipment, at $1,875, includes a heater-defroster and windshield washer.

The 45-hp. engine works on only 6.8:1 compression but asks no coddling; nor need you overwork the four-speed, steering-column shift. Leg room is ample. You can cruise comfortably at 55 or tramp on the gas until a built-in governor calls quits at 4,900 engine revs, equivalent to 70 m.p.h.

In the same price class is the four-door English Triumph Estate Wagon at $1,899. This has a 40-hp. OHV engine, a full rear door, a five-foot-long cargo deck with the seat down, and an advertised top of 78 m.p.h.

The English Morris Minor has traditional wooden trim. The rear door is divided. This saucy wagon comes at $1,937.

From here on, prices slide up like a soprano attacking a scale. Out of Italy comes the Fiat Family Sedan at $2,130. This is a deceptively demure little wagon

Volkswagen Microbus Deluxe version of this capacious German family bus has a roll-back roof panel that's ideal for sightseeing trips and fun for riders. The roomy luggage deck over the engine is shown above.

Tempo Matador Compact front-wheel drive with the engine under the seat gives this German vehicle enormous capacity even with rear seat in use (left). With seat detached, it holds four-by-eight plywood panels.

that can kick up its heels to do 75 m.p.h. when you let out its 43-hp. engine. It too has a single wide rear door.

Hillman offers the four-door Minx, with 44 cubic feet of load space and a fairly sophisticated interior, for $2,300. Its engine is rated at five hp. more than the Husky's, but being a heavier car it's rather less sassy.

The German Taunus Combi, a Ford package, gets into the almost-big class with 172½ inches of overall length and a 67-hp. engine. You can get it with conventional shift, automatic clutch, or overdrive, starting at $2,350.

England's Vauxhall Victor (sold by Pontiac) and Germany's Opel Caravan (by Buick) are good-looking wagons in the medium-price range, with styling strictly from Detroit. About the same size is the Swedish Volvo, which boasts an 85-hp. engine. This wagon sleeps two, and with an optional extra seat can carry seven adults. It tips the price scale at $2,685.

Another German car, the Borgward Isabella, is slightly larger still. It has a unitized body, reclining front seats and about 64 cubic feet of load space. A 60-hp. engine drives split rear axles through a four-speed, synchronized box.

Entrancingly different is the German DKW, a smartly tailored wagon that handles like a sports car, and holds the road as only front-wheel drive can. Way up front is a three-cylinder, two-cycle en-

Thames 800 Estate Bus Little larger than the Jeep, this English wagon hauls eight to 10 passengers. Its short-stroke Consul engine is between the front seats. Bodies come in eight colors and two-tone combinations.

gine—not much bigger than a Detroit glove compartment—rated at 45 hp. It has only seven moving parts—crankshaft, pistons and rods. And it wants to sing.

The DKW is no car for lazy operators or people wedded to automatic drives. But it's just plain exciting to drive. For less footwork, you can get it with a push-button on the stick, which works the clutch.

Its lines are good though less sporty than its behavior. Fittings are excellent, seating comfort fine both in front and rear. All the door hinges have grease fittings. Oil must be added to the gas in a 1 to 40 ratio; ZUERST OEL DANN KRAFTSTOFF (first oil, then fuel) warns the filler cap sternly. Price: $2,500.

The family-bus line of imported wagons goes all out for cargo capacity. Its *bambino* is the Fiat Multipla, a big little-wagon at $1,683. Less than 12 feet long and only 57 inches wide, it has seats for six or, with the rear ones folded down, 75 cubic feet of load space. A four-seat version becomes a bed when you drop the seat backs.

Its rear-mounted little 21½-hp. OHV engine rolls the Multipla at up to 55 m.p.h. A breeze to handle, it steers one-handed even around city corners, yet thanks to independent four-wheel suspension hugs the highway as if on suction-cups.

For up-and-coming families there is the Volkswagen Microbus, which will haul eight full-size passengers 28 miles on a gallon of gas. The seats are four-kids wide (59 inches); 56 inches of headroom will let a Texan get in with his Stetson on.

Seats can be unbolted for carrying big stuff (one owner yanks the middle one, puts in a playpen for his three tots). The 36-hp. air-cooled VW engine can roll this family bus at up to 65 m.p.h. (15 more than the windshield sticker recommends). For $2,120 you get the standard model; $2,567 delivers the deluxe job with glass ports around the top, and roll-back roof.

Half truck, half wagon, a German chassis with a British engine, a sprinkling of Whitworth threads among the metric—that's the Tempo Matador. It is 35 inches shorter than the average American wagon (171 inches overall) but has a phenomenal amount of room inside.

This spatial legerdemain is achieved by tucking the engine in amongst the passengers and doing away with a rear bustle—the body ends with just a smidgin of bumper behind it.

A grip bar is provided—and you need it—for climbing up to the high front seat. Leg room is mostly straight down; you sit bolt upright. If over six feet tall, you may have to take a reef in your neck to see under the windshield top, but for average drivers visibility is wonderful.

What looks like a bus-type door handle is the gearshift. A four-cylinder, 52-hp. Austin engine drives the front wheels. Getaway is good for a vehicle of its size, cornering excellent, steering precise though busy.

The ride is frankly har-r-r-d, but can be softened if top load capacity isn't needed. Window and vent arrangements are a bit primitive, and the front-seat heater, though locally effective, probably couldn't thaw out the cavernous interior in cold weather. But the Matador is a tough wagon that offers literally vast possibilities as a farm, family and vacation car.

All English is the Thames 800 Estate Wagon, sold here by Ford. You could load a school band into it and have room left for the bass drums and tubas. Yet a 55-hp. Consul engine wheels it at up to 70, and its 84-inch wheelbase lets it swing in a 35-foot circle.

Independent front-wheel springing softens the ride, and the three-speed steering-column shift helps American drivers feel at home. More surprising is the step that courteously folds down as you open the side door, and the spare-tire carrier that disappears under the back of the body. (You turn a shaft with the lug wrench to lower it to the ground or hoist it back up.)

You're way ahead of everything but the windshield—or so it feels in these cab-style bodies. Offsetting the obvious risks in a head-on crash is the all-around visibility you enjoy. You can see around corners before you turn them, instead of poking four feet of hood into traffic first.

These aren't all. Other makes of imported wagons and buses are coming in. Still more may appear if they catch on. They offer a shrewd answer to the criticism that the imports haven't enough room. To thousands of savings-minded motorists, the midgets say: "Just load up, get inside, and see." END

What the New Car-Price Law Means to You

Starting October 1, every new car must carry a list-price tag. This article tells how it will affect you when you buy

By Devon Francis

WHEN the 1959 automobiles begin appearing on salesroom floors throughout the land in the next few weeks, you will be able—for the first time in 20 years—to walk in and find price tags on them. It's mandatory. Under a new law, manufacturers must put a price sticker on each car's windshield.

What does this mean to you as an automobile buyer? Is the law foolproof? Can a sharpie dealer still skin you? Will the law stop the notorious practice of price "packing"? Will a new car cost less—or more? Are there factors in pricing that the law doesn't cover?

Some of the answers may be a surprise:

The posted price

Last year, as for many years, a shopper had a hard time finding out the true factory-suggested retail price of a new car. The price usually was anything the dealer decided to say it was. If he was tricky, he could flimflam you by packing the price —over-allowing you on your trade-in and adding the over-allowance to the price of the new car. As a variation of the pack, he could "pump up" your trade-in allowance to make it equal the 25-percent down payment on a new car demanded by finance companies and banks. Again, the over-allowance was added to the new-car price. He could "bush" the price—increase it on one pretext or another after you signed.

Under the new law, the price is posted. It will supply you with a starting point in bargaining for a minimum cash difference *between what a dealer will give you on your trade-in and what he will sell the new car for. (See the accompanying box on what the law provides.) Because the price you pay can go only one way from the posted price—down—your trade-in allowance will be the real nub of your bargaining. The effect of the price ceiling on the "pump up" will be good from your standpoint—it may help save you from unpaid balances and unplanned-for finance charges. And, of course, if a dealer "bushes" the posted price, it's strictly your own fault now.*

The real price

Last year the price at which you bought a new car bore little relationship to the factory's suggested retail price. It could be above or below it, depending on your trade-in allowance. If you were a sharp trader, you smartly ignored the figures on your trade-in and on the total new-car price, and concentrated on the minimum *cash difference.*

Under the new law, that situation is practically unchanged. The posted price will continue to bear little relationship to the real price, thanks to price-slashing —dealer competition for your dollar. The new law probably won't save you money. It may even cost you more. It was the organized dealers, remember, who pushed Congress for it. They figure its long-range effect will be more profit—from you. And also: In keeping with what dealers hope will be a "stabilization" of their business, you probably will find prices up on used-car lots. Here the tag is still anything a dealer chooses to make it; and many dealers count on used-car sales for the biggest part of their revenue.

Seasonally adjusted prices

Last year at this time, during "model cleanup" before the autumn introduction

of the new cars, dealers got discounts of $50 to $100 a car on current-model new cars, and rebates on those that remained on their floors, as an incentive to get rid of their stock.

Under the new law, such seasonal adjustment of prices to the dealer will still prevail, creating an even bigger disparity between the tag on the windshield and the actual going price to an alert buyer.

Your trade-in allowance

Last year the allowance on your trade-in offered by different dealers bobbed up and down like a yo-yo.

Under the new law, the allowance on your trade-in inevitably will be shaved. The trade-in figures quoted you will still bob up and down, but the price ceiling reduces a dealer's room for maneuver. The more you argue for a greater discount from the posted price on the new car, the lower the allowance on your old car will go. Again: The only meaningful figure in the transaction is the cash difference.

The option trap

Last year the wildly gyrating prices quoted you on a new car were linked in part to options. A Ford price, for example, could contain 37 optional extras, not counting nine tire options. Buick had 45 options, not counting five tire options and seven paint options. Option prices—whether the equipment was installed at the factory or at the dealer's—could be anything the dealer decided the traffic would bear. This was part of the price pack.

Under the new law, the factory-suggested retail price of each extra-cost option not included in the overall factory-suggested price must be posted on the windshield sticker. That's your departure point on discounts. The dealer can't pack an item. But here's a trap. The unscrupulous dealer can charge you anything he pleases for options not on the car when it comes from the factory—that he installs himself. These can be numerous—whitewalls, heater, radio, outside rear-view mirror, and so on. The law's restrictions will encourage the dealer to push the sale of his own extras. Your only protection is to insist on itemization on the proposed bill of sale, and to check the dealer-installed option prices among several widely dispersed dealers before you sign the contract.

Shopping for a price

Last year you could shop for a new car at one dealer's after another, until you managed a satisfactory cash difference between your trade-in and the price of the new car. You also ran across a wide choice of models, colors, trims and options that way. If one dealer didn't have what you wanted, another did, or he could get it for you by trading cars with a brother dealer.

Under the new law, you will find shopping around less profitable. The stickers will tend to stabilize going prices and to discourage poaching—what dealers call "cross-selling." You probably will find it harder to come by exactly the model, color, trim and options you want except by ordering and waiting. The windshield stickers will tend to discourage the trading of cars among dealers. It can still be done under the law, but dealers have agreed to make such trades, in general, only intrastate.

Your warranty

Last year you ran the risk of buying a "bootlegged" car—one that had been sold by a franchised dealer, hard up for cash, to a dealer not recognized by the factory. The bootleg dealer did not have to honor the new-car warranty.

Under the new law, the bootlegged car, with or without sticker, is easier for you to spot. It's second-hand. The dealer has no commitment to honor the warranty. More important, the net effect is to discourage bootlegging and maintain a fixed price among dealers.

Here's what the new law provides

UNDER a new law applying to 1959 automobiles, each car leaving the factory must bear a sticker on the windshield containing the following information:

- The make, model and serial number.
- The final assembly point.
- The name and location of the dealer to whom the car is consigned.
- The method of transportation used in making delivery to the dealer.

The financing "pack"

Last year your dealer was more or less satisfied to bargain on the basis of a trade-in allowance and the price of a new car. Since he had room to maneuver for his profit on those two items, his finance charge on the unpaid balance could be at a fixed rate. At most, he might take a small extra profit—by charging you six-percent interest and discounting the loan to a bank or finance company at five percent or less.

Under the new law, you will be fair game for the buck-hungry dealer who, bumping up against the price ceiling, resorts to the finance pack for more profit. Only 22 states have usury laws applying to financing unpaid balances on cars. Even these laws permit a charge as high as nine-percent straight interest (which on a monthly repayment basis amounts to an actual 18 percent for a year's contract, and 36 percent on a two-year contract!). The average simple-interest charge is about seven percent. The amount of the dealer's profit on a finance pack will depend on how fast you are with a pencil. Remember, you don't have to finance your balance through a dealer. If your credit is good, the personal-loan department of any bank will give you a rate as low, if not lower.

Insurance

Last year your financing included a mandatory charge for "comprehensive" insurance, covering fire, theft, vandalism and collision with a $50-deductible clause, to protect the financing company's collateral (the car, that is).

Under the new law, this cost in car buying is wholly unaffected. The price on such insurance fluctuates widely, depending on the price of the car, the ages of the drivers who will use it, and the geographical area where it will be driven. Don't forget to take out public-liability and property-damage insurance, which is not required by the financing institution. One uninsured accident could wreck you financially for life.

Misleading advertising

Last year you were importuned to buy a new car on the basis of would-you-take advertisements, citing fat allowances on your old car, and no-money-down-$50-a-month come-ons. While the dealers' trade group, the National Automobile Dealers Association, deplored the practice, it was not uncommon. The lack of posted prices, of course, made this possible.

Under the new law, the "bait" advertisers will be hard up against the inflexibility of the fixed price in coining offers. You are likely to get less of this type of sharpie advertising.

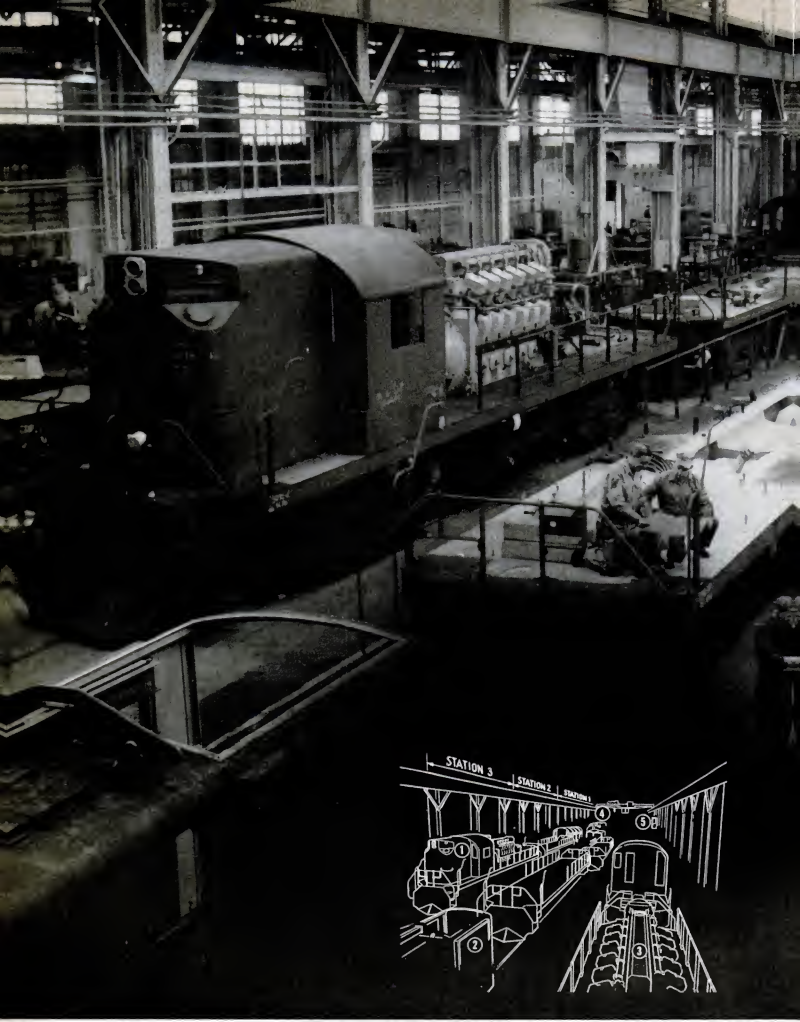
The gobbledygook

Last year your contract for a new car bore charges for "EOH" or "DEH" or "D&H," or whatever mumbo-jumbo a particular dealer used. Even the manufacturers, who are the authors of these cryptograms, can't agree on a literal translation of them. Generally, they cover freight from the factory plus "preparation and handling"—which means what the dealer charges you for getting the new car ready for delivery—plus excise tax.

Under the new law, the gobbledygook is, for the first time, partly broken down into specific costs. The freight charge from the factory must be specified on the windshield sticker. If you want to find out what kind of a profit margin your dealer has to bargain with on the "preparation and handling" item, take the fifth entry on the sticker—the retail delivered price suggested by the factory. Subtract 25 per cent. Roughly, that's what the car cost him, exclusive of state or local taxes, if any, and freight. Now take 10 percent of that figure. That's the excise. Add the excise to the freight charge, which is the seventh entry on the sticker. Subtract that from the sum in the cryptogram. What remains is his charge for "preparation and handling." END

- The retail delivered price suggested by the factory.
- The retail delivered price suggested by the factory for each accessory or appliance that is physically attached to the car at the time of its delivery to the dealer and that is not included in the price specified in the paragraph above. (Loophole here: exclusion of options installed by the dealer himself.)
- The freight charge from the factory.
- The total amount of the prices specified in the previous three paragraphs.

The law applies to both domestically manufactured and imported cars.



Locomotive assembly line. Two locomotives a day—one on each of two shifts—are turned out in this new 1,190-foot-long production plant at ALCO's works in Schenectady, N.Y. Fabrication from steel plate to finished locomotive is done at stations along three assembly lines. Diesel engines are built in an adjacent shop and put in place by crane.

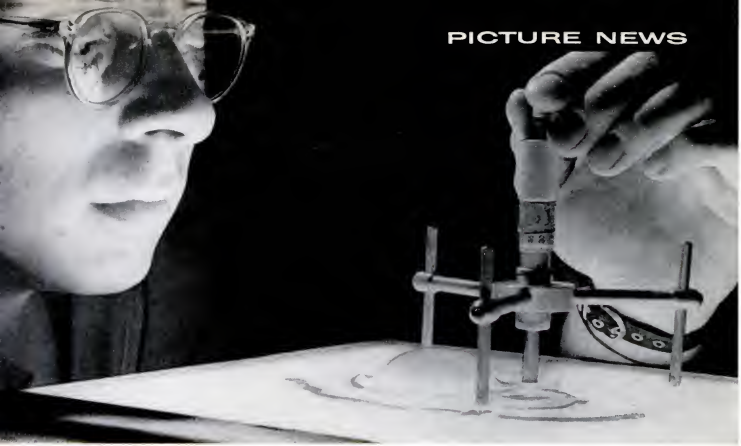
Picture News
IN THE WORLD OF SCIENCE

Shown here in various stages of completion are an 1,800-hp. loco (1) for Argentina, an engine hood (2) ready to be dropped over its engine (3), a "world locomotive" model (4) for passenger and freight service in Spain, and the foreman's control center (5). ALCO is the largest exporter of mainline diesel electrics. Locomotives sell for $180,000 up.

Top idea. When you walk up to this machine, built by Reclamation Bureau aids at Sacramento, Cal., an electric eye sets it in motion. A music box plays, moving printed tapes give a pep talk on employee suggestions and you get a shine.

Bowl-shaped phone. The base of this new Hungarian telephone looks like an inverted dish. Dial, bell, switch and cradle are combined in the one-pound unit. Recesses in the plastic hold the handset in any of four positions.

Supersonic two-seater. This McDonnell F4H-1 is the Navy's first supersonic two-seat all-weather interceptor. It is capable of long-range delivery of conventional and nuclear weapons, is powered by two GE J79 jet engines, and can fly at twice the speed of sound carrying a pilot and radar observer. At each side under the belly are mounted Sparrow III air-to-air missiles. The F4H-1 can refuel while in supersonic flight.



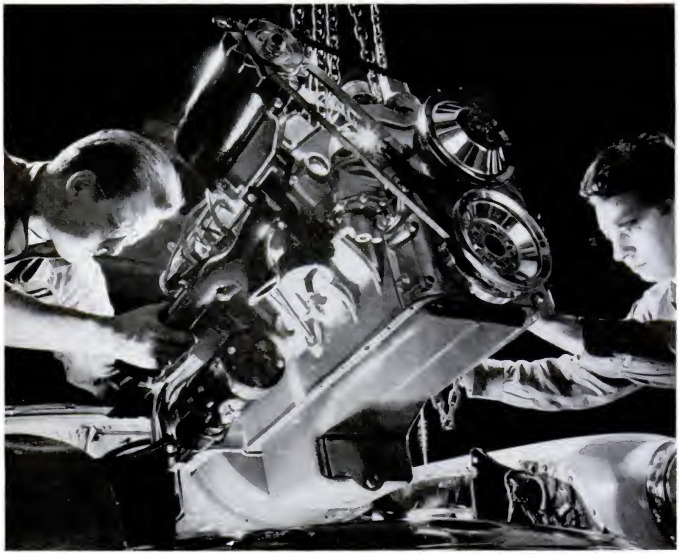
Miking an egg. How high the white of a freshly broken egg stands is an indication of its quality. Here a technician takes an accurate reading with a micrometer in what the U. S. Department of Agriculture's marketing service poultry division calls a break-out test. This method judges egg quality by observable condition of the yolk, and "Haugh units"—scale readings based on egg weight and the height of the egg white.

Sprightly Sprite. Newest model in the Austin-Healey line, this two-seater is as fresh and appealing as a bowl of strawberries. Its price, $1,795, is also attractive. The Sprite is a true sports car with low center of gravity, good cornering. Its four-cylinder, 48-hp., 57.8-cubic-inch engine is a special version of a power plant that set records at Bonneville in 1957. It does over 80 m.p.h., gets 35 miles to the gallon.

Jeep-mounted belt loader. Luggage is whisked aboard an airliner here on a conveyor belt attached to the top of a Jeep. The two-foot-wide ramp is 20 feet long, can be raised at front from five to 11 feet. Power to operate the loader is supplied by a pump driven by the crankshaft.

Automatic bagger. This new check-out counter in use in a Cincinnati supermarket contains an automatic sack filler. As the cashier rings up each item, she pushes it into a well. When the well is full, she presses a button. A vacuum system then goes into operation, moves a sack into position, opens it, lets the groceries slide in easily and gently.

Jumping jet. The first supersonic fighter to take to the air at zero length, this combat-loaded North American F-100D Super Sabre blasts off at Edwards Air Force Base, Cal., from a ramp mounted on a trailer. The rocket slung under its tail provides a 130,000-pound thrust. The Air Force plans next to attempt launching medium and heavy bombers with the same system—vital should enemy attack destroy an airbase.



Aluminum auto engine. An experimental aluminum V-8, one of a series built by GM, is being lowered here into a test car. Weighing 30 percent less than a standard engine, it saves a load equal to one passenger. This one is handmade. They won't be seen in new GM cars for some time.

Tiny switch. This sub-subminiature switch, made by Minneapolis-Honeywell for electronic, aircraft and missile devices, measures .2 by .35 by .5 inch. Ten of them will fit in a square inch of space.

Glare-free bulb. Better distribution of light is claimed for this new Westinghouse bulb (left). The shape enlarges surface area, and a silica coating is said to diffuse light better than frosting.

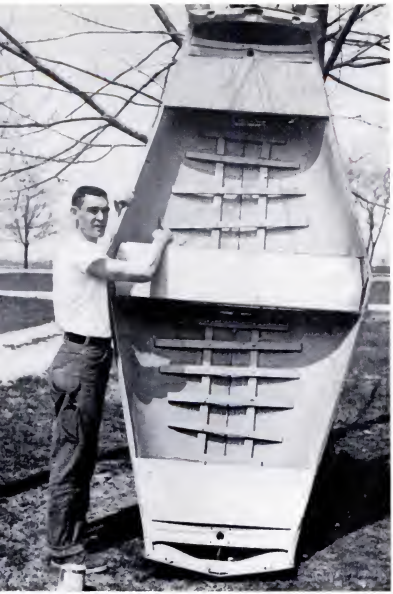
Metal-cutting with chemicals. Current-bearing electrolyte dripping through this glass tube cuts the toughest metals. An anode on the plate being machined and a lead strip (cathode) in the tube at the top are the electrodes. The electrolyte is a common acid. GE, developing the process, sees it useful for machining new aircraft and missile metals.

Floating ranch house. Man, this is living! This houseboat, the Driftwood, built by Larry Vita, Northport, N.Y., contractor who specializes in homes as well as boats, has a spacious living room—pardon, main saloon—with three picture-window exposures and a real fireplace. The windows open and shut by motor—the plate glass slides down into the walls and screens take their place. Behind the snack bar is a fully equipped kitchen including an electric range, sinks and built-in refrigerator and freezer. Each of two bedrooms has its private bath.

The 28-by-60-foot boat is powered by three 60-hp. Mercury outboard motors, each with a control lever. They are sunk in wells—one each on the starboard and port decks near the stern and one under a carpet in the saloon. When he feels lazy, Vita fishes through this one.

Plug-in traffic light. A socket in the pavement holds this portable traffic light upright and supplies current to operate its stop-and-go signals. Removed and out of the way during normal periods, it is plugged in for rush-hour traffic. The new light is being tested in Oldenburg, Germany.

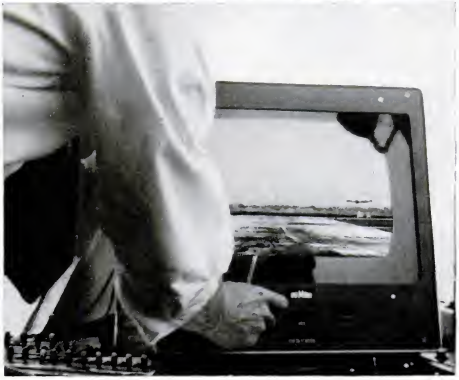
Saddle rides wall. Better than walking a one-foot ledge 60 feet above water and jagged rocks, rodmen ride to make survey readings at Vaquero Dam near Santa Maria, Cal. They made this saddle from old washing-machine rollers, a bike sprocket and chain. It's hand-pumped.



Highway to waterway. Having served their turn covering the front ends of a pair of 1948 Oldsmobiles, these two automobile hoods were welded together to get a second life as a fishing boat.

Charles Beverage of Monroeville, Ohio, made the craft for lake fishing and duck hunting. Parts cost him $12 at a junkie.

Copter pours concrete. Swinging a hopper of wet concrete under its belly, a Sikorsky S-58 helicopter pours footings for power-line towers in California's Santa Susanna mountains. It hauls in loads from a mixer at a base camp.



TV peers at planes. Operators in the control tower at New York's LaGuardia Airport use closed-circuit television to see around corners. Their view of one of the runways is obstructed by hangars (*top above*) so a camera at one end (left) brings a picture of landings and takeoffs to a tower screen (right). The equipment, installed by Du Mont, is operated by remote control. The camera mounting breaks loose if hit.

Woodsman spares no tree. The sharp, heavy-duty shearing blade on this tractor-mounted land clearer cuts off trees evenly with a single pass. Then a second pass splits the stump with a projecting "stinger," killing the root, and a third cuts the stump off level with or below the ground. The machine is made by Rome Plow Co., Cedartown, Ga.

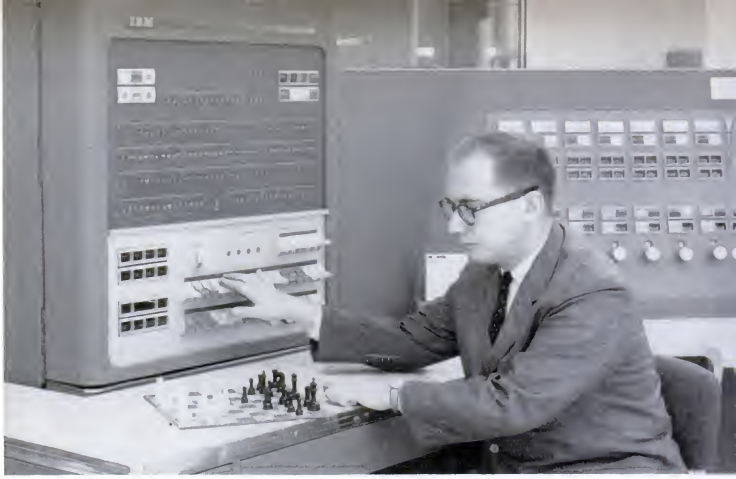
Personal rocket. This fearsome contrivance may someday be used by soldiers to scale cliffs, leap rivers, and run like race horses. It has two jet nozzles that release compressed nitrogen gas at the touch of a hand control. The man above is an engineer for Reaction Motors. Inset photo shows newer version that uses rocket fuel stored in belt canisters.

Little man, big job. A nick in a compressor blade can mean serious—sometimes fatal—trouble when an F-104 Starfighter is doing Mach 2 or better. So at Westover Air Force Base in Massachusetts, Paul Klatt Jr. crawls through six-inch-wide airscoops at each morning inspection to be sure none of the F-104 jets based there will disintegrate when compressor blades turn at 15,000 r.p.m. or more.

Sometimes with a whetstone he can correct minor damage himself; sometimes he suggests that an engine be pulled for major repair. So far,

on his recommendation, three big engines have been taken out—and in each case further inspection justified his decision and overhauls were made that may have resulted in the saving of pilots' lives.

Here Klatt, a Lockheed civilian employee, talks over a problem with Sgt. Gerald Williams, crew chief, and gets a boost that's better than a stepladder. Below, he works at the far end of a jet—and comes out smiling, mission accomplished. Klatt has no present plans for joining the Air Force. He is four feet, six. Air Force minimum: five, two.



Chess-playing computer. This electronic "brain," taught by IBM scientists, plays a polite but aggressive game of chess. It makes no blunders, always capitalizes on an opponent's mistakes, and can furnish stiff competition to anyone but a master. The machine can't abide cheating. Make a wrong move, it won't budge until you correct it.

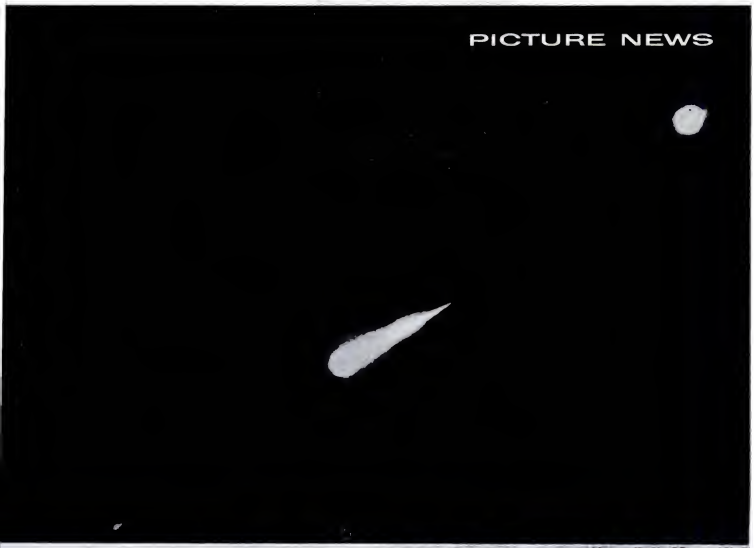
Mammoth cell. A million times the size of a human red blood cell, this model is a generalized representation of *all* body cells. Bits of plastic tubing show what protoplasm looks like when magnified. Fat globules, membrane, nucleus, and structures involved in nutrition and energy are also accurately shown. The cell was designed for an Upjohn Co. display at an American Medical Association meeting in San Francisco.

Sight-seeing station wagon. So his children could see the sights better, Peter P. Stevens converted his station wagon into a scenic cruiser when he moved his family from Cleveland to California. He cut out the top and built in its place a raised sun deck equipped with seats. The seats fold down flat at night to become beds for roadside camping.

Straight up and down. This jet plane accomplishes vertical takeoffs and landings without sitting on its tail or tilting its wings. Instead, the Bell X-14 employs "Venetian blind" vanes to deflect its jet stream downward, and rises and alights in conventional horizontal position. Since elevators, rudder and ailerons have no effect during hovering, compressed-air nozzles at wing tips and tail are used to control direction.

Power towers. An experimental transmission line to be built next year by GE at Pittsfield, Mass., to operate at 750,000 volts, nearly twice today's highest, will have new "bridge" towers. Shown in scale here with a present model, they will be 160 feet high, 180 feet across.

Wholesale cleanup. This vacuum cleaner, overgrown cousin of the familiar household aid, sweeps 1,000,000 square feet of runway in an hour. Cleaners are produced by Consolidated Diesel Electric of Stamford, Conn., to keep dirt and trash out of jet intakes at Air Force and Navy bases. They are built on Ford truck chassis, powered by two engines.



Jupiter re-enters atmosphere. First released photograph of the re-entry of a Jupiter IRBM into the earth's atmosphere is shown at top. From lower left to upper right are nose cone, rocket body and instrument package. Below is some of the equipment that photographed the missile—a Barnes spectral meteor camera mounted, to offset ship roll, between stabilized five-inch guns of the destroyer Stickell.

Do-It-Yourself Long-Distance Dialing

Automatic mechanisms are bringing radical changes in our use of the telephone. By 1965 you should be able to dial any number in the country

By Don Wharton

TODAY telephone users are themselves dialing over 10 million long-distance calls a week without any help from an operator. Better than one out of five of all long-distance calls are being dialed by customers—a fabulous do-it-yourself development. Here is a revolution in communications which is fast spreading over the country. A decade ago distant dialing by U. S. phone users was a world-of-tomorrow dream. In 1948 a few hundred suburban phones in Media, Pa., were hooked up for test dialing to Philadelphia. Three years later the test was broadened out and 8,000 phones in Englewood, N. J., began dialing many distant points. During 1956 the phones connected for distant dialing reached the million mark. Today it's over six million, by this year end will be over eight million, by next year end 15 million. The schedule of the Bell System and the nation's 4,000 independent telephone companies calls for virtually every phone in the United States to be in dial contact with every other phone by 1965.

WHEN MACHINE MAKES A MISTAKE—about once in 3,000 calls—data is automatically recorded on punch card and light goes on to signal a maintenance man, who runs a test to pinpoint trouble.

Last month I sat down at a desk in New York before a telephone and, by simply turning the dial, got a number in San Francisco, then others in Dallas, Denver, Washington, Chicago and Portland, Ore. The total time to get connections with all six numbers, including my six dialing times, added up to only three minutes, 31 seconds. That's really fast—35 seconds a call compared with the Bell System's average connecting time of over 72 seconds on all operator-handled long-distance calls. But averages can be misleading, blur the true picture. So I went to another phone and put in calls to these same six numbers through regular long-distance operators. Their times to get the identical six connections totaled seven minutes, 49 seconds.

Extra speed is only one advantage of direct distance dialing—the Bell System

WHEN YOU DIAL a long-distance call, an Automatic Accountant begins punching holes in a tape to record your number and the number called, date, connecting and disconnecting times. The tape is then fed into a decoding machine that punches the data onto IBM cards. These are fed into still another machine that computes charges and taxes, and prints them on your phone bill.

calls it DDD. You don't have to talk to an operator, spell out the names of cities and exchanges, give your own number or overhear operators talking to other callers. (In some cities with DDD an operator at present comes on the line to ask for your number—nothing more.) A psychologist told me that all these items put a strain on telephone users. He says you feel you are being interrupted, are uncertain your call is being handled properly, think you are being delayed much more than you are. When you dial yourself all you hear is a faint click, then a phone ringing. In most cases I found it took the person at the other end longer to answer after the ring than it took the mechanism to select a route, send an impulse across the continent, and initiate the ringing.

The only difference from dialing a local call is that you dial the three digits of the area you are calling plus the desired number. New York's area number is 212, Los Angeles 213, Dallas 214, and so on. To get TRinity 7-9970 in Detroit you dial 313 TR 7-9970. Some area numbers cover entire states—503 for Oregon, 602 for Arizona, 702 for Nevada. Canadian cities and provinces also have area numbers and are moving ahead with DDD . You don't have to remember these numbers—they are in your directory. The nationwide numbering plan means every phone number in America will be different. There can be several with the local number MA 2-9971, for example, but only one 213 MA 2-9971. Incidentally, these area numbers weren't assigned haphazardly. Tests showed that dialing 919 or 817 takes nearly two seconds longer than low numbers such as 212—and the telephone people are greatly interested in seconds. The low numbers were given to big-city areas that get the most calls. Saving a second on each long-distance call means saving 900,000 hours of line time a year.

Two elaborate mechanisms make long-distance dialing possible. One is the automatic switching equipment that connects the calling with the called number. Actually this mechanism begins working before you have finished dialing. If you are calling FRanklin 9-0745 in Miami you start by dialing 305. Soon as the switching machine gets these three digits it begins trying to find a route to Miami —without waiting to learn what local number you are going to dial. The machine instantly tries the first-choice route to Miami and if that is tied up, automatically begins trying to find an open route. For example, if you are calling Miami from Youngstown, Ohio, the machine first tries the route through Pittsburgh. That circuit being busy, it tries an alternate one through Cleveland, gets Cleveland but is blocked between there and Miami. It tries to go on from Cleveland by way of Jacksonville, then tries the Atlanta route, then Cleveland-Pittsburgh-Miami, Cleveland-Pittsburgh-Atlanta-Miami, Cleveland-Pittsburgh-Jacksonville-Miami. Blocked on all seven, it tries an eighth and gets the Youngstown-to-Miami call through by way of Cleveland-Pittsburgh-Atlanta-Jacksonville.

The machine does all this in about 12 seconds—so fast you aren't even aware of

SPEAKERPHONE is being widely tested—75,000 are now in use. With a mike in the base and separate receiver alongside, you can write freely or move about. Handset may be used for privacy.

DON'T TWIRL—PUSH. Experimental pushbutton phone is promising. Tests show that in calling an average number it takes about half as long to punch keys as it does to spin a dial.

a delay. Does the machine ever make a mistake? Yes, a survey shows one error in 3,000 calls—we telephone users average 90 dialing errors in 3,000 calls. But when the machine makes a mistake it senses something is wrong, stops, refuses to go on, automatically turns the whole call over to a companion mechanism which gives it a second try. However, before starting the second try the equipment calls in a trouble recorder which makes a record of all the data, punches it on a card, feeds the card to a mechanical judge which decides how serious the mistake is. If minor, it signals with an amber light; if major, it flashes a red light and sounds a clanging bell.

The second key mechanism in DDD is an Automatic Accountant. It sits in a metal-and-glass cage, shoulder-high, and to me resembles the interior of a typewriter turned upside down. When you dial a long-distance call it begins punching holes in yellow-paper tape about three inches wide. The holes record your number, the called number, the date, the connecting time and the disconnecting time. The tape is fed into decoding machines which punch the data onto IBM cards which are fed into more machines. These compute the charges, figure out the federal taxes and then print the charge on your phone bill. The Automatic Accountant cancels out all uncompleted calls (mainly "busies" and "no answers"), which account for three out of every 10 calls made in this country. (In Sweden the "no answers" are more numerous. People there have switches—turn off their phones at night or whenever they wish to be undisturbed.) If you don't know the number you want to call you simply dial an operator. If you dial a wrong number, the operator gets the charges canceled.

DDD causes people to use long distance more, even after the novelty wears off. Of some 35 persons I talked with, all except three had increased their long-distance calling after DDD. One telephone-company study indicates an increase of six to 10 percent. As one man told the San Diego company, "You people have made it too easy to talk too long." Besides the extra speed and convenience, DDD apparently gives people a feeling of accomplishment ("Makes you feel you're handling the whole thing") and a feeling of nearness and privacy ("When you dial someone or they dial you, it sounds like you are in the same town").

At present most DDD makes only station-to-station calls. For person-to-per-

EUPHONIOUS PHONE: Instead of a jangling bell, a musical tone (radiating from the louvered area at base of set) summons you to this instrument. It uses one volt; bell on your phone takes 85.

WHERE SHOULD THE DIAL BE? They're trying this dial-in-the-handset as a possible improvement on present design. Handy for nearsighted users—but maybe a bit shaky for accurate fingering?

son calls you still call the operator. But telephone engineers have developed equipment that will do that too. The first trial run with this person-to-person equipment was started last June on Manhattan's YUkon 8 exchange. I went to a YUkon 8 phone that day, dialed three person-to-person calls, was amazed with the results. In 50 seconds I had a designated Cincinnati resident on the line, in 57 seconds I got a San Francisco businessman, in 64 a businessman at another San Francisco number. It's simple. Suppose you want to call Frank Doe at his office in San Francisco. You dial zero plus Doe's regular DDD number. In a second or two you hear a pleasant triple tone and say "I want to speak to Mr. Frank Doe"—nothing more. Then the phone rings in San Francisco, an operator asks for Mr. Doe and he comes on.

After three samples of this magic I went around to the YUkon 8 exchange to find out how it really works. When you reach your party and start talking, the operator simply pushes an amber button on her desk that gets her off the line and tells the Automatic Accountant to start timing your call and make a note that it's person-to-person. She says nothing, fills out no slips. I also watched an

CENTRAL RINGER—for use in homes with more than one phone—replaces separate bell in each instrument. Chain pull enables the subscriber to switch from bell to chime as he prefers.

operator handle a collect call dialed by the customer—she determined that the charges would be accepted, pushed another button and the Automatic Accountant timed and recorded the call. Credit-card calls are also handled under this system, but here the operator fills out a tiny ticket, which the Accounting Department matches with the record of the Automatic Accountant. In a few months, this system (or person-to-person DDD) will be tested in Poughkeepsie, N. Y.

Tests such as these, preceded by research and development, are the reason for vast improvement in telephone service, particularly long distance. Six decades ago the only way you could put in a long-distance call was to go to a toll office. Even as recently as 1920 the average long-distance call from your own phone required 14 minutes connecting time. The total connecting time for my nine calls (three person-to-person and six station-to-station) wasn't even half that.

None of this means we've reached the ultimate in telephony. There are field tests underway right now which indicate that in a very few years our telephones will be greatly changed. Here's how:

1. You will be putting through all your own long-distance calls, including person-to-person, collect and credit-card calls. You will get many overseas numbers the same as any out-of-town call. American tourists will dial home collect.

2. You will not dial at all—instead you will punch keys much like those on a 10-key adding machine. If this idea doesn't appeal to you, don't worry—two-year tests at the Bell Telephone Laboratories show that most people think they will dislike keying numbers. But after experience with key phones, over 99 in 100 prefer them to dial phones. The tests show they are much faster—five or six seconds to key an average number against 10 to 12 seconds to dial it. Saving: 120,000,000 hours of line time a year.

3. Your phone number may be seven digits rather than two letters plus five digits. Exchange names such as MAin and BUtterfield may be dropped, keys will carry no letters on them; all-number calling could eliminate one of the chief causes of dialing errors: confusion of the letter O with the digit 0 and the letter I with the numeral 1. Most people would say it's easier to dial MA 5-7436 than 625-7436 and that's what many telephone experts thought. Then the question was studied at the Bell Laboratories by a "human factors" group headed by a lanky South African, Dr. J. E. Karlin. Tests were given to hundreds of average persons.

With the all-number dialing, their accuracy improved slightly, their speed increased 10 percent, their ability to remember numbers was virtually unaffected.

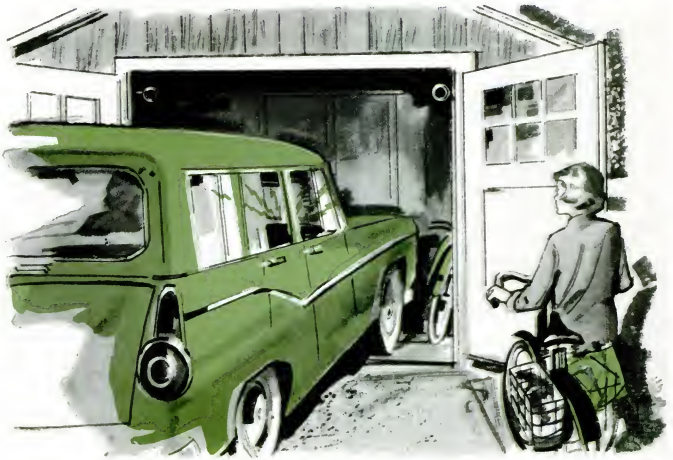
4. You will get many local numbers without dialing or keying. Instead you will simply push one button or lever which will automatically punch the number for you. This summer I saw an instrument that does that—you load it with the 50 numbers you call most frequently, move an arrow to the one you wish and wait for the instrument to dial it. The Bell System has made about a hundred of these for customer trials in certain areas. Plans are being considered for customer try-outs next year of an instrument to take several hundred numbers.

5. You will have a hands-free phone if you wish. Instead of holding a receiver in your hands you will talk naturally from your desk or living-room chair or while moving about the room. Your voice will be picked up by a microphone in the key-set and your caller's voice will come through a speaker whose volume can be controlled. When you phone relatives, both families will be able to join in—just as if they were visiting one another in a living room. Already 75,000 speaker phones are in use, but the Bell System has developed a new, streamlined model with increased clarity. I tried it on several calls, immediately wanted one. Several hundred will be manufactured soon for sale to customers in a full market test.

6. Your phone will have no bell—instead you will hear the more pleasant sound of a tone-ringer. Tone-ringing phones have already passed customer tests in Crystal Lake, Ill. While the sound seems softer, many users reported it easier to hear at greater distances.

About 40 years after inventing the telephone, Alexander Graham Bell said: "Leave the beaten track occasionally and dive into the woods. You will be certain to find something you have never seen before." That's what the telephone people are doing to bring about customer dialing of long-distance calls and all the other telephonic wonders on the horizon.

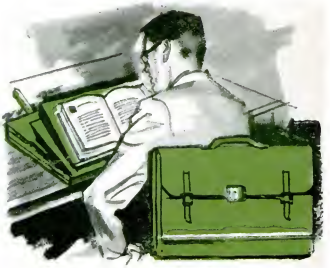
New Ideas from the Inventors



1 Radio "Beams" Car into Garage. To help you steer a wide car into a small or equipment-crowded garage, this recently patented system would transmit buzz-signals from both walls to an auxiliary antenna on the car radio. Different tones would tell to which side you were off course; volume would tell by how much.

2 Anchor Guide Protects Boat. With this holder bolted to the prow, you wouldn't have to lift the anchor aboard to keep it from banging against the hull. The anchor could be raised or lowered from any place on deck, and, when pulled up, would seat in the flared, non-swing sheath.

3 Briefcase Props Up Book. A rack like this could add comfort to studying or note-taking. A fold-out ridge on the front of the dual-purpose case would support your book, and adjustable hinges would fix its angle. A speaker might use the portable lectern for his notes.

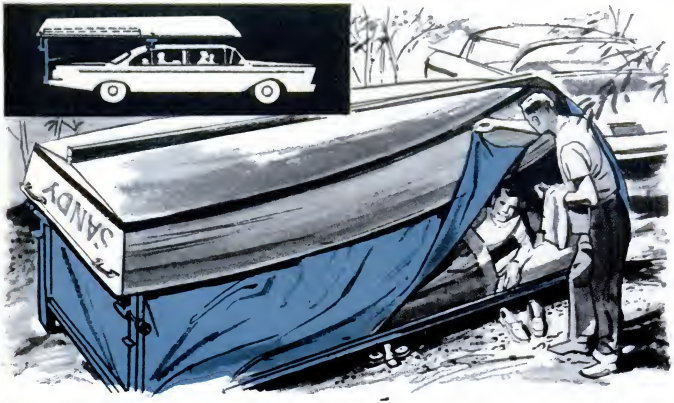


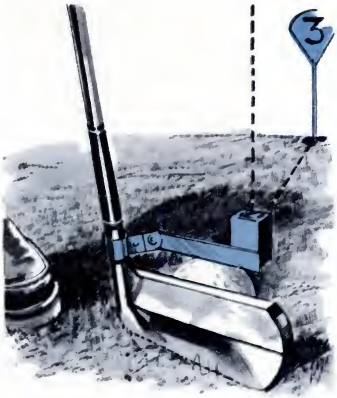
Please turn the page for more new ideas

4 Powered Bayonet Digs Trench. Any GI who's dug foxholes in hard ground might welcome this shot-powered digger. Attaching the bayonet to the muzzle and firing a bullet would drive the blade. The bullet's force would be spent in passing through a curved exit channel.

5 Hanger Adjusts to Garment. Coats and jackets wouldn't sag or stretch out of shape while closeted on adjustable hangers like these. The arms could be moved in or out to fit different sizes accurately. Separated completely, the parts would stow compactly in a travel case.

6 Car-Top Boat Sleeps Campers. To let you carry a larger boat on a hunting or fishing trip, this inventor would extend a car-top rack out to the rear bumper. Removed from the car, the boat, supporting rails, and folded platform could be set up as shown to serve as a canopied sleeper big enough to provide shelter for four.





7 Lens Sights Golf Ball's Path. Similar to a camera's viewfinder, this adjustable sighting device would visually align the club, ball and cup. As a putting-practice aid, the sight could be quickly removed or attached to a club, or pivoted in or out of operating position.

8 Pipe Lighter Tamps Tobacco. A pipe smoker could leave a pocketful of accessories at home if he carried a lighter like this. A tamper and combination reamer and pick would be hinged in the lower part of the case for convenient use. The pick could also be used for punching cigar ends, and the scraper blade might double as a pocketknife.

9 Conveyor Helps Garden Grow. To assist Nature in propagating plants (and possibly to ease vacation problems for flowerpot gardeners) this inventor would cycle seedlings through more perfect weather than Nature provides. A timer-operated chain drive would water the pots and sun them under artificial light.

The following patents *have been issued on these inventions: 1. Patent No. 2,818,553 to David Jaffe, Great Neck, N. Y.; 2. No. 2,743,696 to George Moxwell, White Bear Lake, Minn.; 3. No. 2,822,847 to Anthony Cesaroni Jr., Apalachicola, Fla.; 4. No. 2,823,481 to Stephen Walter, Washington, D. C.; 5. No. 2,817,470 to Frank Simon, Brooklyn, N. Y.; 6. No. 2,817,852 to Nels Neilson, Bellingham, Wash.; 7. No. 2,822,614 to Vincent Susinno, Leonia, N. J.; 8. No. 2,633,137 to Paul Nartagon, Ft. Lauderdale, Fla.; 9. No. 2,824,410 to Alfred Dow, Naperville, Ill.*

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D. C., at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.

Whether you're an old hand or a novice at high-fidelity, you'll find wise counsel in this expert's report on—

5 Big Mistakes That

By James J. Carroll
as told to Robert Gorman

FOR the last 32 years I've been selling and servicing the most wonderful machinery in the world—high-fidelity equipment.

I figure hi-fi has to be wonderful to please so many people in spite of the mistakes they make in buying and the way they misuse their gear after they get it.

What are the mistakes? Well, in a field that's so personal no two people can agree on the right time, there's sure to be disagreement on any list. But I'll go out on a limb with these five:

- One out of every two buyers picks the wrong loudspeaker for his system and listening room.
- Perhaps three out of four hi-fiers make the wasteful error of confusing power with quality.
- About the same number overspend on gadgets and features they'll never use.
- The better components used in four out of five assemblies are downgraded by mismating, poor installation, or both.
- More than 90 percent of the high-fidelity elite—the fellows who turn up their noses at automatic record changers—squander the benefits of their expensive tone arms and turntables by improper mounting.

Although other technicians, salesmen, and assorted experts may argue with some of my pet gripes, most will go along with my basic points: Costly mistakes in buying and using hi-fi are too common. You can avoid most of them by shopping the right way in the right places. Expert advice is easy to come by. And on the whole, knowing too little about hi-fi is less of a danger than knowing too much.

What do I mean by "mistake"? I say a buyer has goofed when he either gets poorer performance than he could have had for the same money, or when he buys less than a reasonable minimum of convenience and quality.

Sound reproduction is a science. It can be measured with rulers, meters, oscilloscopes, and a roomful of other instruments. It can also be judged by a trained ear. To me, better hi-fi means sound reproduction that has less distortion, emphasis or interpretation. The wise shopper comes as close to this ideal as possible at whatever price he can afford.

1 Selecting the wrong speaker

The rule about getting what you pay for pitches a mean curve at the part that's hardest to judge—the loudspeaker system. Consisting of one or more speakers and enclosures, it is an electromechanical transducer that changes electric signals into movements of air. It is affected by many physical, mechanical, and electromagnetic variables.

Speakers, therefore, figure in a majority of buying errors. This weakest link in the chain of hi-fi parts is also the final one. Any interpretations or distortions it creates will be added to those that originate up ahead.

Listening is the only practical way to judge a speaker system. The usual ear-pounding demonstration leads most buyers astray by putting more emphasis on the flashy extremes of sound than on the features they'll have to live with. There's an almost universal tendency to over-rate the significance of thundering crescendos, wall-shaking bottom bass, and flute

James J. Carroll, the author of this article, is manager of the hi-fi department at Harvey's, a popular hi-fi store in midtown New York. He began selling radios in 1926, and was a pioneer manufacturer of sound equipment for movie theaters—where hi-fi started.

Hi-Fi Buyers Make

or triangle passages that go whistling beyond the audible-frequency range. And in the hurly-burly of comparison testing, it's all too easy to overlook these essential facts: 1) Any outfit sounds better when it's played loud; 2) showy "demonstration" music often will make even a poor system sound good.

I don't mean to suggest that power and broad frequency response aren't valuable, but rather that loudness may be a deceptive substitute for clean bass and treble. Good low-frequency reproduction is the most expensive part of high-fidelity. Because it's almost transparently clear and effortless, it may seem less impressive on first hearing than the boomy, resonant bass that is both technically inferior and much less satisfying for the long haul.

And concentrating on the highs and lows can lead you smack into another buying error: neglecting the midrange.

Unless you have an ear for absolute pitch and follow the score while you listen, it's practically impossible to tell whether music coming from a loudspeaker is faithful to the original performance. Voice sounds are much more familiar to your ear, so your instinct about "natural-sounding" speech is likely to be more dependable. A tape recording of a male voice you know well is ideal for some of your test listening—especially in revealing false, reverberant bass that pitches a voice a couple of octaves deeper than it really is—but any broadcast or recorded male voice can tell you a great deal.

Among other things it lets you judge response to "transients" or abrupt peaks of sound. To reproduce transients cleanly a speaker's drive mechanism must be able to start and stop moving very quickly. Both music and speech are full of transients, but speech is more revealing of the slightly slurred or muddy quality that is the mark of poor transient response.

High and low frequencies, not present in speech, are the frosting on the musical cake. They add excitement to the music, but there aren't too many. Voice frequencies span a range that includes about 98 percent of the sound energy in music. It's a mistake to compromise clean midrange sound—where you'll do most of your listening—just to get overly impressive bass or treble. A system that doesn't give inside-the-room-with-you reproduction of voice is scarcely worth further consideration.

The wooden baffle or enclosure that helps a loudspeaker pump out the longer, low-frequency sound waves is an integral part of a system. Test listening has little value unless you hear the speaker and enclosure together. Good speakers, like good enclosures, can be interchanged to some extent, but it's a mistake to ignore manufacturers' recommendations in picking combinations.

The function of an enclosure is to reinforce and direct sound waves—not to generate them. Baffles that aren't rigid enough can contribute as much vibration as the speaker, so no matter what *type* you select, make sure it's solidly constructed. A good test is to whack the box in a few places with a rubber mallet. You should hear only a dull thud. If there's any kind of a ringing tone, the box can never do justice to a good speaker.

2 *Confusing power and quality*

Amplifier power is another red herring for many buyers. There's nothing wrong with power as such, provided you don't exaggerate its importance or let it steer you off real essentials. For good listening, an amplifier should have low distortion at levels of one watt or less, plus a substantial reserve of undistorted power to cope with instantaneous peaks of sound.

The point is that it's easier—and there-

fore less costly—to build a good 20-watt amplifier than an equally good 50-watter. The combination of high power and high quality is dandy if you can afford it (and may be necessary for some installations) but for any given price you'll probably have to choose between them. If that happens, I'll take quality every time.

Most buyers would agree in theory, but in practice they mistakenly assume that a higher power rating is a sign of better performance. Actually it's not much of a sign of anything except that fancy wattage figures have a lot of sales appeal. There's a fine British-made amplifier being sold here as a 20-watter; in its own country the identical unit is rated at 10 watts. Though the distortion level is several times greater at 20 watts than at 10, the ratings are equally accurate—and meaningless.

Big amplifier power may—or may not—do some good. I've known a number of cases where it did some expensive harm. There was one young man, for example, who traded up to a classy 50-watter—and came back a few days later with what was left of his 20-watt loudspeaker. His kid, the man explained ruefully, had turned the volume all the way up to see what the amplifier could do. It did it. The speaker was never designed to handle that much power, and its cone had been buckled by the overload.

Several other kinds of overbuying fall in roughly the same class—like paying hefty premiums for handsomely styled components, and then hiding them behind cabinet panels. This is actually a double error. Pancake-type units are made for table-top use and usually need the exposure for adequate ventilation. So building them neatly into closed shelves or cabinets also invites service troubles.

3 Buying unnecessary gadgets

Most people buy some controls or features they could do without; some shoppers go completely haywire over dashboard fittings. Others uselessly duplicate controls on tuner and amplifier. How many knobs, switches, inputs and outputs are really useful? The answer obviously depends on your present or future plans; if you don't have any special plans, the standard assortment of tone controls, switches, phono, radio, and tape inputs that you'll find on all modern amplifiers and pre-amps is likely to be big enough.

Among the common extras you can probably do without is a wide selection of record-compensation circuits. At one time recording companies followed a hodge-podge of systems for pre-emphasizing certain parts of the sound spectrum. Then a good amplifier had to have several different "compensation curves" to make discs sound right on playback. But recordings have been standardized for several years, so you now need only one kind of compensation to play any modern pressing.

The same goes for variable speaker damping: It has marginal use at best, and none at all if you buy a loudspeaker that is properly matched to your amplifier.

In the main, such features are only superfluous, not harmful. There's no need to avoid them if they happen to be tacked on a unit you like. Just don't sacrifice quality for the sake of gadgets, don't pay extra for them, or let them limit your choice.

4 Mismating of components

One thing worse than spending money on the wrong features or components is buying the right ones and using them wrong. Troubles arising from home-grown modifications and additions affect speaker systems most often. More and more loudspeakers and enclosures are being engineered as teams; people create trouble by making changes the designers never intended. The worst offenders—or maybe the word is victims—are those who have enough skill to do it themselves but not enough up-to-date information.

For some years now a majority of hi-fi speaker systems have included separate woofers and tweeters to handle low and high frequencies with greater efficiency. Lately there's been a vogue for adding a third, midrange, speaker to subdivide the frequency spectrum still more. With proper isolation and crossover networks channeling frequencies to the speaker that can handle them best, a separate

midrange can be a worth-while improvement. But it shouldn't be added to an enclosure designed *only* for a woofer and tweeter without competent advice. You can unknowingly create more distortion than the added midrange was supposed to cure.

5 Improper mounting of the tone arm

There's a lot of talk going around—with which I agree—that manual turntables and tone arms are better than automatic changers. They usually cost more and lack the convenience of record-stacking and automatic shut-off, but they're easier to use for single records and certainly do reduce record wear, rumble and distortion.

It beats me, however, why anyone should pay the price of a first-rate turntable and arm, and then throw their expensive virtues out the window. They do this all the time through careless or improper installation. Potentially, the big advantages of manual setups are: 1) more precise tracking, reducing distortion; 2) less force needed to keep the stylus in the groove, cutting record wear; 3) better mechanical drives, reducing noise, wow and flutter. These advantages are frequently washed out by mismounting the arm, failing to level the turntable, and combining the turntable and speaker in a single cabinet.

If you mount a tone arm yourself, make sure you follow the manufacturer's template to the letter. Unless your tools and skills are equal to real precision work, have the job done by an expert. By expert I mean a bona fide hi-fi specialist—not the neighborhood handyman.

Does your wife have the last word on the furniture that will house your sound system? Then don't waste your dough on an elegant turntable unless you can resist her demand for "one neat package." Putting the turntable in the same cabinet with a loudspeaker cancels the low rumble, distortion and record-wear advantages you pay for. The reason, of course, is that vibration is carried back through the wood. You could create the same troubles by mounting equipment on connected shelves of a bookcase or built-in.

Where else do audiophiles go wrong in arranging components? The twin errors are stacking some too compactly, and spreading others too far apart. With most—though not all—phono pickups, the length of the shielded lead connecting the cartridge to the amplifier must be held down. When it's overextended, the shield becomes a high-frequency filter. This means that some delicate overtones never even reach the amplifier.

Most other "location errors" can be traced to installations that allow too little—rather than too much—space. Magnetic phono pickups are far and away the most popular types in hi-fi use. Being magnetic, they have a tendency to pick up hum. If a turntable and amplifier are to be mounted side by side, the amplifier should always be placed where it will be farther from the tone arm. Countless owners arrange the units wrong-way-to, with the result that the AC field in the power transformer is close enough to affect the cartridge. It's just as incorrect, of course, to crowd the tone arm directly above or below the amplifier, near a window air conditioner or any other motorized gadget. It should be separated from the nearest hum generator by at least a foot; two feet or more would often be better.

If you must stack a radio tuner and amplifier, put the amplifier on top. Most hi-fi stackers do it the other way, neglecting the fact that the amplifier generates more heat. Heat rising from an amplifier is enough to drift the most stable FM tuner circuits off-station.

Though I've painted hi-fi as a thousand-legged monster that's waiting to trip you up at every turn, don't be afraid of it. Careful checking against the points made in this article will arm you against most of the possible buying errors. Couple this with the advice of the man who will back his word with a guarantee, and you'll get the most hi-fi for your money. END

All stirred up about STEREO? Planning to try this exciting new development in hi-fi sound? Then read the inside story in October PS and learn to tell fact from fancy in the claims made for stereo sound. Also in October: An authoritative story tells you how to buy or build a top-notch speaker enclosure.

what's new

the latest in tools

Odd-shaped brackets and other small metal parts take form fast in the midget hand bender above. The interchangeable dies (inset above) put curves or right-angle bends in metals up to ⅛″ thick, 1¼″ wide. The bender, tightened by a small jack screw, is sold by Edes for $4.95.

Want to bend even bigger stuff? Clyde's new portable tool shapes steel reinforcing rods (up to ¾″) to any form for concrete work. Price: about $40 . . . New carpenter's levels use a pendulum arrangement, instead of a bubble, to show degrees of angle directly on a dial. They work in all positions for checking flat, vertical and slanted surfaces. McMillan & Weakley sells them in lengths from 8″ to 72″ for about $10 to $20.

Self-tightening pipe wrench at left, not seen in this country since the war years, is back again from Germany. Its spring-loaded jaw automatically adjusts to each pipe size and slips backward for a ratchet action. Damar sells a 6″ model for $1.85, a 10″ for $3.25.

New two-speed portable belt sander, at right, can be switched to 1,100 feet per minute for fast smoothing of rough lumber, or to 800 feet for fine finishing or paint removal. The Skil tool takes a 4″-wide belt, sells for about $90.

Stanley's new line of power tools, some still top-secret, will include a 3″ portable belt sander (about $85), and an orbital model (about $50) . . . Smaller shop motors may be on the way. A flat "pancake" design, by Allis, is said to cut motor length 60 percent. It will come in ratings from one to 15 hp . . . Here's a switch on soldering: Ungar's *de*-soldering tool, with special tips for quick melting and repair of soldered terminals.

for your car

Want an inexpensive mobile home for camping trips? You can build the traveling bunkhouse at right for $2 worth of plans and about $30 worth of materials to fit either a pickup truck or small trailer. Easi-Bild sells the plans, based on Homasote building panels for insulation.

New long-life car battery guaranteed to last 50 months—or over four years—will be sold by Electric Auto-Lite for about $50 . . . No danger of over-running your garage if a pair of bright-colored metal wheel chocks are placed just ahead of the end wall. Vi-Jo Sales Co. prices them at $4.25 . . . Retractable work light can be moved anywhere around a garage, then automatically winds itself up neatly on a wall-mounted reel. Cordomatic makes it in 20-, 30- and 40-foot cord lengths . . . Latest way to carry fresh drinking water along on trips is in 12-ounce sealed cans, adapted from wartime survival kits. Sold by Pennsylvania Processors, they require only one thing—a can opener . . . Two aids for custom stylers: Bolt-on louvers 3½″ long, for real or just pretend, are sold by Almquist unpainted or chromed for 35 and 55 cents each . . . Decorative trim strips can be applied from self-adhering sheets of simulated gold or chrome. The 12″-by-27″ sheets can be cut with scissors, are sold by Newhouse for about $4 . . . Two-in-one auto altimeter shows barometric pressure as well as altitude so it can also be used to help predict weather. Taylor sells it for $12.50.

Plastic oil filter, at right, makes use of Tenite's habit of holding a static electric charge. The charge is said to help attract fine metallic particles and keep them from being recirculated through your engine. Acme filters to fit most makes of cars and trucks sell for $1.50 apiece.

More new products on the next page

what's new for home improvement and upkeep

Slip-on downspout cap, at left, has connectors for garden hose so you can drain rainwater away from the house and prevent flooding. Neo Products sells Rain-Verts to fit round or square pipe ($2.95). Added bonus: You can run the hoses to flower beds for extra watering.

You'll be seeing a new line of hardboard products, called Plateboard, by Abitibi. Designed for good-looking, low-cost paneling, it comes with oak- or walnut-grained finish and in plain, planked and checkerboard patterns. Average cost for paneling an 8′-by-12′ room: about $70 . . . New asphalt roof shingles, by Barrett, have two wide tabs per strip, instead of the conventional three narrow ones. The idea: to help add that long, low look important to modern ranch-style houses.

Difficult stair building is made easy by the new metal guides below. You simply nail the forms to side boards and trim off ends (left), then fit treads and risers in between them (center). In finished job (right), the guides become completely invisible. Bilco sells them for about $12.

Sheldon Gallager

for more information:

Here's where to write if you can't get any item listed: **Abitibi Corp.,** *956 Penobscot Bldg., Detroit 26;* **Acme Plastics,** *1129 E. 2nd Ave., Pine Bluff, Ark.;* **Louis Allis Co.,** *427 E. Stewart St., Milwaukee 1;* **Almquist Engineering,** *Milford, Pa.;* **Barrett,** *40 Rector St., NYC 6;* **Bilco Co.,** *37 Water St., West Haven, Conn.;* **Clyde Mfg. Co.,** *Bridgeway at Turney, Sausalito, Cal.;* **Cordomatic,** *17th and Indiana Ave., Philadelphia 32;* **Damar,** *128 Damar Bldg., Elizabeth, N.J.;* **Easi-Bild Pattern Co.,** *Pleasantville, N.Y.;* **Edco & Co.,** *114 N. 13th St., Philadelphia 7;* **Electric Auto-Lite Co.,** *Toledo 1;* **McMillan & Weakley Co.,** *P. O. Box 6522, Indianapolis 27;* **Neo Products,** *Erie, Mich.;* **Newhouse Auto. Ind.,** *5805 E. Beverly Blvd., Los Angeles 22;* **Pennsylvania Processors,** *Lewisburg, Pa.;* **Skil Corp.,** *5033 Elston Ave., Chicago 30;* **Stanley Tools,** *New Britain, Conn.;* **Taylor Instrument,** *95 Ames St., Rochester, N.Y.;* **Ungar Tools,** *4101 Redwood Ave., Los Angeles 66;* **Vi-Jo Sales,** *Box 287, Geneva, Ill.*

How to Take Care of a Car's Air Inlets

By Phil McCafferty

CLEANING your car's radiator bug screen a couple of times during the season is just a start in caring for the ventilation system. There are a dozen or more other points where your car takes in air or lets out vapors.

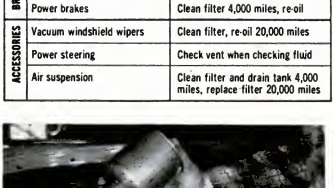
It may be news to you that:

- Plugged differential vents can cause grease seals to blow out or leak.
- An improperly serviced oil-bath carburetor cleaner can cost you two miles per gallon on mileage.
- Air-cooled automatic transmissions have been known to explode for want of

DUST-CHOKED FILTER in this automatic-transmission air scoop caused severe overheating. Out of sight under the car, it was neglected until its screen was completely clogged.

Air-Intake Checklist

	Where	What to do and when
ENGINE	Carburetor air cleaner	
	Oil-bath type	Clean filter and refill housing each oil change (same weight oil as crankcase)
	Oil-wetted type	Clean and re-oil filter each oil change
	Dry-element type	Bump clean 4,000 miles, replace 20,000 miles
	Crankcase breather system	
	Oil-wetted breather cap	Clean and re-oil filter 4,000 miles
	Dry-element cap (accessory)	Blow 4,000 miles, replace 20,000 miles
	Draft-pipe filter	Clean filter 4,000 miles
	Draft pipe	Swab pipe clean, yearly
	Willys draft valve	Clean filter 4,000 miles
	Distributor	Check vent opening 10,000 miles
	Gas-tank vent tube	Inspect for kinks—blow clear with compressed air if clogged
GEARS	Transmission (all)	Check vent opening each lube, solvent-clean if required
	Automatic transmission (air cooled)	Clean air-scoop filter 10,000 miles
	Flywheel housing	Check vent opening each lube
	Differential	Check vent opening each lube, solvent-clean if required
VENT. SYSTEM	Fresh-air heater	Clean intake screen as needed, clean water drain twice yearly
	Weather-eye heater	Remove insects from heater core, wash filter 10,000 miles
	Air conditioner	Wash filter 10,000 miles, check condenser
BRAKES	Master cylinder	Check cap vent when checking fluid, solvent-clean if required
	Power brakes	Clean filter 4,000 miles, re-oil
ACCESSORIES	Vacuum windshield wipers	Clean filter, re-oil 20,000 miles
	Power steering	Check vent when checking fluid
	Air suspension	Clean filter and drain tank 4,000 miles, replace filter 20,000 miles



OIL-FILLER-PIPE CAP filters air entering the crankcase. You can check its condition each time you add oil. Tip: When it's dust-choked, you can figure most other filters need cleaning, too. Dip it in kerosene and re-oil.

a simple cleaning of a clogged screen.

- Hard starting in the morning could be traced to a plugged distributor-cap vent.
- A plugged oil breather cap might cause your car to "use" oil.
- A kinked or clogged gas-tank vent tube will starve, then stall your engine. It might even cause the fuel pump to collapse a near-empty tank.

Follow the checklist on the left to cover all your car's air openings. They may vary on your make and model, so compare the list with your owner's manual. The frequency of service can depend on the climate and driving conditions.

Metal-mesh, cloth, hair and felt filters are best cleaned in kerosene. Dry-element filters, like those found in new carburetor air cleaners, need only to be bumped against the bench to jar the dirt loose. Most vents can be readily cleared with an ice pick, or if they can be removed, cleaned with kerosene. Glass-fiber filters should be washed in water.

Next time your car is on the grease rack don an old jacket and have a look under. The topside checks can be made in your own garage.

Check the vents on the transmission and differential that allow vapor generated by heated lube to escape. And check the crankcase draft tube.

A dripping vent is normal in at least one place. That's the tiny vent hole in the bottom of your car's flywheel housing. It drains off any vapor, water or oil that otherwise would collect inside. Plugged, it has been known to cause clutch chatter and frozen starter drives.

Topside, check the heating-ventilating system, the distributor-cap vent and the little filter on the vacuum windshield-wiper motor that prevents inhalation of harmful materials. Inspect the gas-tank vent tube, usually found skirting the inside of the trunk. Cargo sometimes slides against it and kinks or flattens it.

Too much oil in an oil-bath air cleaner is as bad as none at all. Overfilling closes the air passages and acts like a partially closed choke.

Ford '54-'57 OHV engines have a filter on the crankcase draft tube in addition to the breather-cap filter. Since engine oil splashes past the base of the filter cover, take care to renew or replace the cover gasket after cleaning. Poorly seated,

In fire engines as in motor cars, Champions deliver full-firing power.
Above: Champion-equipped Mack "pumper" in Garden City Park, L. I.

Q. Why do all the major fire engine makers use Champion spark plugs?

A. Champions give full-firing power. Put new Champions in your car every 10,000 miles. You'll get an *immediate* boost in horsepower...and save gasoline, too!

World's favorite spark plug—engineered for every car built by Ford, General Motors, Chrysler, American Motors, Studebaker-Packard and every major foreign maker

CHAMPION

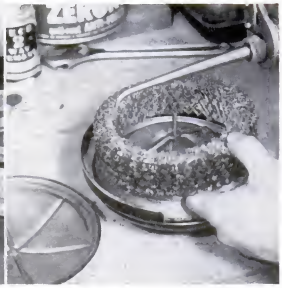
a leaking gasket can pump oil out on the ground fast.

The new gimmicks on today's cars mean more or different filters or vents. Air-conditioning systems have glass-fiber filters similar to those used in home hot-air heating systems. If the air conditioner's condenser unit is in front of the radiator, the bug screen should have frequent checks.

Finally, if your car rides on airbags, you'll find a filter on the air compressor, and a plug that can be removed for periodic draining of the air-reserve tank.

BIGGEST GULPS OF AIR are taken by the carburetor through one of several types of filters. New dry-element type shown above is the easiest to clean; just bump it against the bench or sole of your shoe to dislodge dirt, or blow it clear with air.

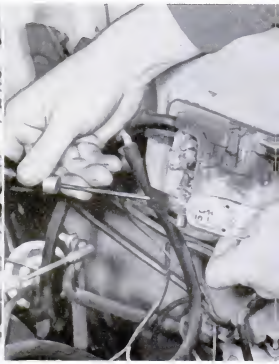
OIL-BATH FILTER is usually a ring of metal mesh set in an inch or so of oil. Dump out the old, dirty oil and slosh the element in kerosene to remove dirt. Pour oil in air-cleaner unit only to mark shown. Overfilling restricts the flow of air.



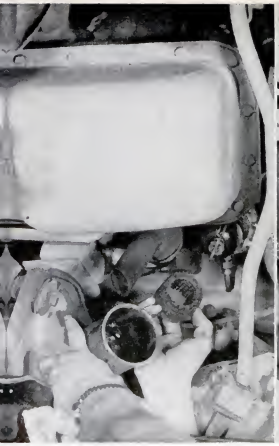
OIL-WETTED FILTER has no reservoir. It depends on the oil-saturated metal filter element to trap dust as air passes through it. To clean, slosh the element in kerosene. Shake or blow it dry, then saturate thoroughly with squirts of engine oil.

DIFFERENTIAL VENT allows vapor generated by heated lubricant to escape. In its exposed position atop the rear axle, it becomes quickly coated with mud, road dirt and caked grease.

AIR CONDITIONERS and some heating systems have glass-fiber filters, which rapidly collect bugs and dust in summer driving. Remove and flush the filter with water to clean it.

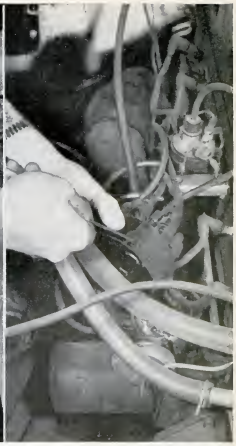


VACUUM WIPER MOTOR has a tiny felt filter hidden under the cover to keep dust out of the vacuum chamber. Stab it with an ice pick or a pin to remove it for cleaning with solvent.



AIR COMES OUT OF CRANKCASE through this draft tube beside the oil pan. Some cars have a filter in the tube or directly above it, which should be cleaned with kerosene. Clear the tube itself with a rag wrapped around a screwdriver.

FLYWHEEL HOUSING at the rear of the engine has a small vent hole to exhale harmful vapor, oil and condensation that otherwise would settle on parts inside. Wipe away grime around the hole and poke it clear with an ice pick or a long nail.



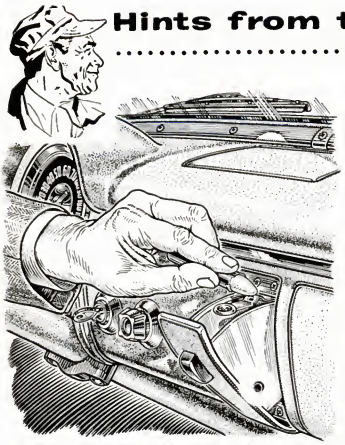
DISTRIBUTOR CAP is vented to prevent condensation inside. You'll find the tiny hole under one of the cap clips. Poke it clear, taking care not to crack the cap; or better, wash the cap in solvent and dry it thoroughly with a clean cloth.

POWER-STEERING RESERVOIR takes in air and discharges hot-oil vapor through a tiny vent in its cover. Remove cover, wash it with kerosene and dry thoroughly before reinstalling.

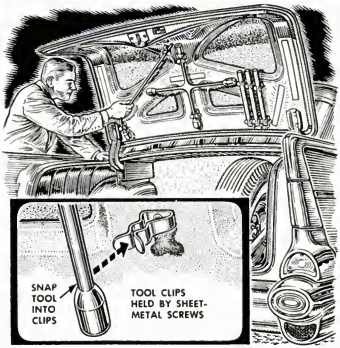
POWER BRAKES have an air-intake filter on the vacuum booster. Check it if the pedal returns too slowly. On all hydraulic brakes there is a vented filler cap on the master cylinder.

AIR-SUSPENSION COMPRESSOR is fitted with an intake filter that should be cleaned at regular intervals. Drain the reserve tank occasionally, too, to remove condensed moisture. END

Hints from the Model Garage

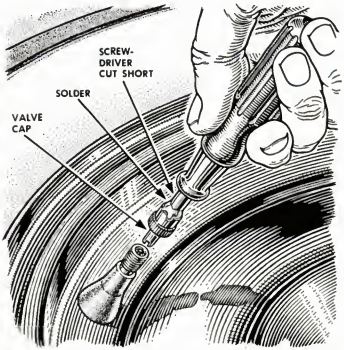


A smooth-working ash receptacle can be yours with little trouble. Just rub a stainless grease stick on the spring latch. Pull the receptacle out beyond its stop, empty it, wipe the latch clean of cigarette ashes, then lubricate its sliding surfaces lightly.

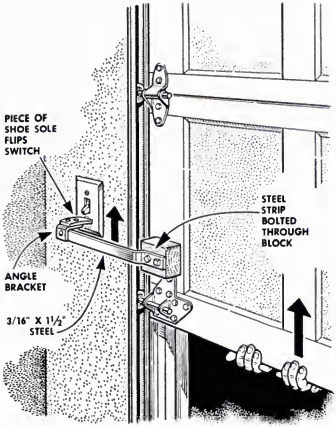


For more trunk space—and fewer rattles—install spring clips on the underside of the trunk lid to hold the tools you carry for roadside repairs. Strips of reflective tape stuck beside the tools will warn oncoming motorists when the lid is up.

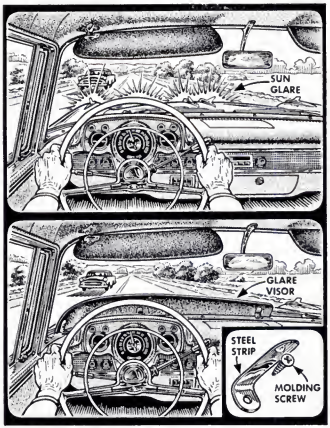
Double-ended hooks bent from coat-hanger wire can relieve an overcrowded glove compartment. Slip them over the top edge of the right scuff panel for hang-up storage of a whisk broom, windshield scraper, or a flashlight with an end ring.



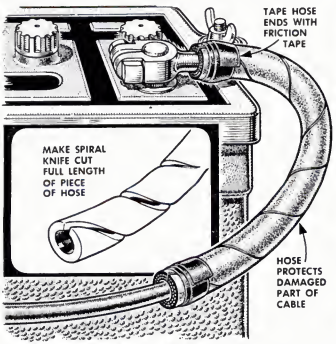
A handy tool for tire-valve cores can be made by soldering a slotted valve cap to the shank of an old screwdriver. The tool won't be blown from your hands as happens occasionally when a cap is used to remove the core from an inflated tire.



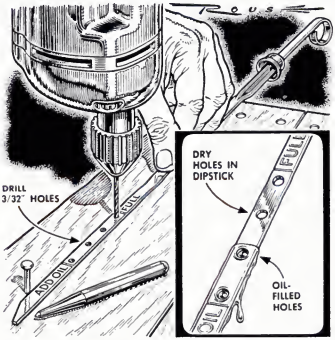
Automatic garage-light switch is actuated by a leather "thumb" mounted on an extension arm on the garage door. The leather tab must be stiff enough to flip the toggle as the door is raised or lowered, yet flexible enough to brush past it.



You can shield your eyes from hood glare, when driving toward the sun, by placing a strip of cardboard across the bottom of the windshield. Cut the strip to block out the hood—not the road—and screw metal clips to the molding to hold it.



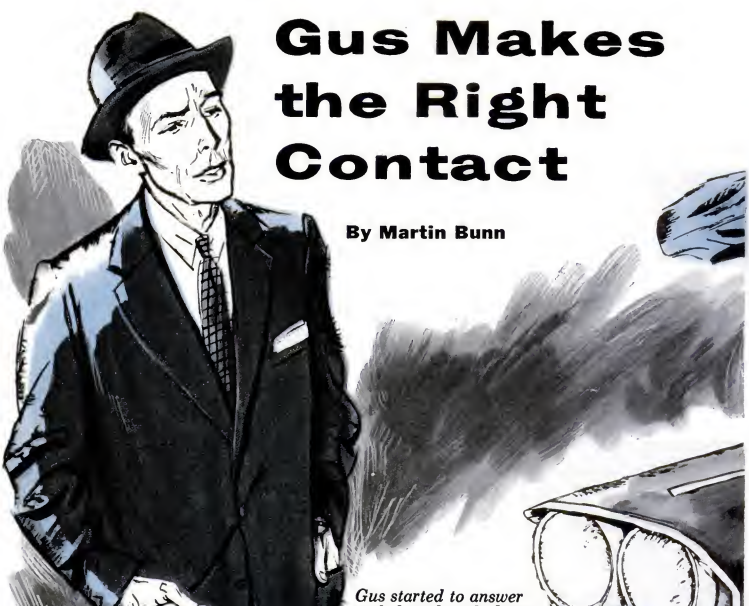
Reinforce heavy insulation, or cover it if it's frayed, by wrapping with garden hose. Use a sharp knife to cut a continuous spiral from a piece of the required length, then wrap it around the wire. Twist it tight and tape the ends.



Reading the crankcase dipstick will be easier, especially when the oil is fresh and clear, if you drill four small holes between the FULL and ADD OIL marks. The holes covered by oil will appear as tiny lenses; the others will remain open.

Gus Makes the Right Contact

By Martin Bunn



Gus started to answer and then thought better of it. Instead, he said, "Maybe I can find the trouble for you."

"THE upper crust has arrived," said Stan Hicks as a long, sleek, black sedan pulled up in front of the Model Garage. A distinguished-looking man wearing a black Homburg was at the wheel. "Bet he's a Wall Street broker, Gus."

"What makes you think so?" asked Gus Wilson, who was putting away his tools.

"You can tell just by looking at him."

Gus wiped his hands on a piece of waste. "There's an old saying, Stan, 'Don't judge a book by its cover.' " He stepped out of his coveralls and hung them up. "Take care of him. I have to see Red Ellis about the Legion dance."

"Thought you decided to call it off because you couldn't afford an orchestra."

Gus laughed. "That's what Red thought. But I have a surprise for Mr. Ellis. There's a deal cooking. Be back in half an hour, Stan."

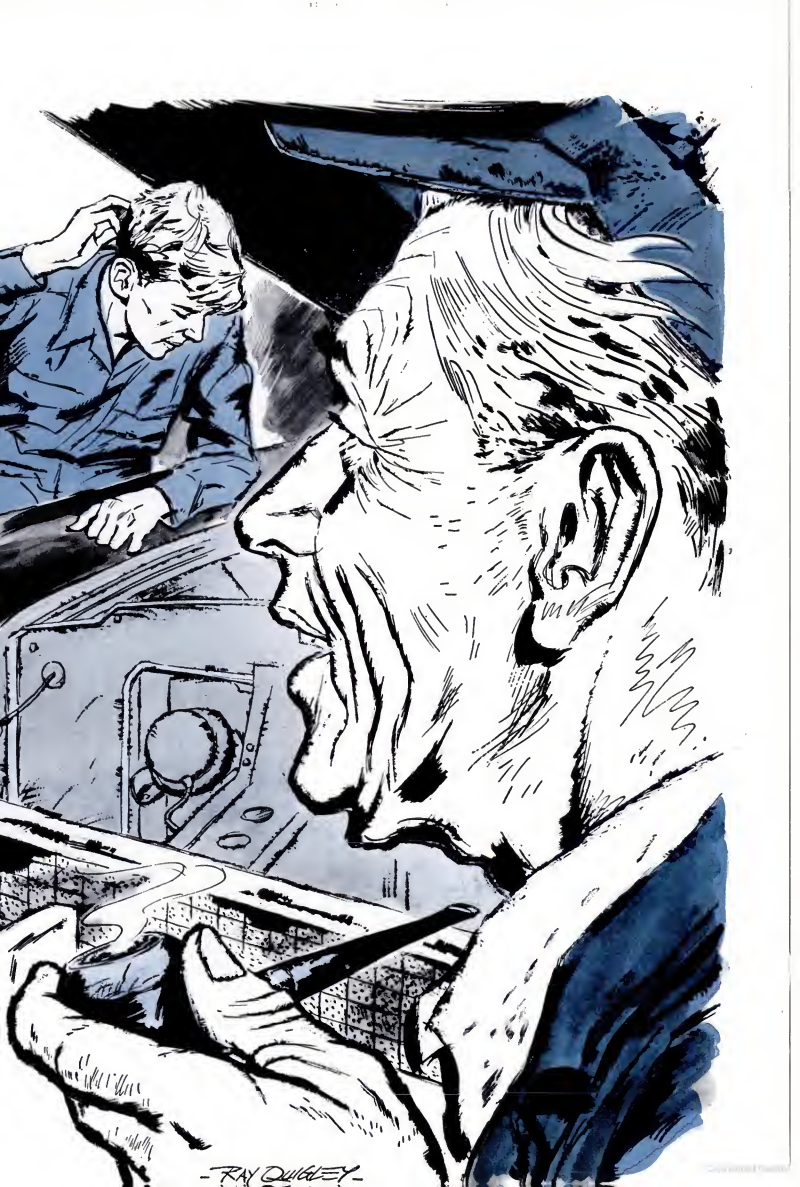
Stan walked over to the big car. The driver uncoiled his lanky frame from behind the wheel and smiled ruefully.

"You'd think that a car with only a hundred miles on it could make the trip from Durgin to Centerville without acting as if it wanted to roll over and die."

He was tall, around 40, dressed in an obviously expensive suit and spotlessly shined shoes. As he talked, Stan noticed, he drummed nervously on the hood of the car with his manicured fingernails.

"What's the trouble?" Stan asked.

"Wish I knew. It runs all right for a while. Then all of a sudden it just stops. I held up about 15 cars back on the East Endicott Bridge. Ran like a dream for the salesman I bought it from a couple of


-RAY QUIGLEY-

days ago. Burns me up to get hooked like that."

"I know what you mean," Stan said. "Let me take it inside and have a look."

"Okay, pal, but make it as snappy as you can. Have to see a guy here in town and then I'm due over in Centerville tonight. Miller's the name."

Something in the way he introduced himself made Stan feel that he should recognize the name. Probably some bigshot financier, he mused, although that didn't tie in with the flip way he talked.

INSIDE the garage, Miller paced up and down as Stan went to work. First thing he looked for was a vapor lock. It wasn't that. Every few minutes the man poked his head under the hood, cutting off Stan's light, urging him to hurry.

"Where's Gus Wilson?" he asked as Stan examined the sediment bowl while checking the fuel system.

"I'm doing the best I can," Stan said, ignoring the question about his boss. He removed the porcelain strainer. The screen was clean and the bowl fresh.

"What's that you're doing now?" Miller asked impatiently. "All I want you to do is fix it. I don't want it rebuilt."

"I have to check the line from the sediment bowl to the fuel pump," Stan explained. "Might be clogged. It can happen even in a new car." He went over the fuel-pump screen.

The light was blocked out again as Miller's angular face appeared over the radiator. "Do you have to take that thing out?"

Stan was hurt. That "thing," he pointed out, was the carburetor, and it had to be removed for a dirt-check.

"Maybe I should call Mr. Wilson . . ." Miller began.

"Hold your horses, mister," Stan broke in. "Some things you just can't hurry."

Stan could take a carburetor apart and put it together blindfolded. This one was as open and free as a newly cleaned pipe. He tightened it back in place.

The man again. "You *are* a mechanic, aren't you?" he asked.

Stan controlled his temper. "About all that's left is the electrical system."

"Say, how many systems does one of these buggies have? You've been poking around in there half an hour."

"This guy's been working too hard. He's cracking up," Stan said to himself as he tackled the distributor. It was slick as a whistle. Suddenly he struck pay dirt. "I think I've found it," he exclaimed.

Miller came over, and this time Stan didn't mind the man watching.

"Notice when I pull the center wire out of the distributor. See? There's no spark against the block when I work the starter. They must have given you a bum coil. Anyhow, that's where your trouble is." Stan wasted no time getting a new coil out of stock and into the car.

"Now," he said, "you've really got a spark there. Guess we're ready for a test run. I'd go along, only I've got to keep an eye on the garage. Just drive around a few blocks and try it at different speeds." Stan spoke with assurance.

JUST as Miller's car turned the corner, Gus appeared from the other direction.

"Boy," said Stan, "I've sweated out almost an hour over that buggy. He's trying it out now. But I think I got it licked. Turned out to be the obvious thing after all—coil trouble."

"Hope you're right," Gus said. "Red Ellis and I got to going round and round about the dance. Sorry I took so long, but the guy I was expecting never showed."

A few minutes later Stan looked up and saw, to his dismay, the sleek car heading for the garage. It was being pushed by another car. At the wheel was the impeccable but frustrated Miller. Stan glanced at Gus, who had a wide grin on his face.

Miller slid out of his car and faced Stan. "You know, man," he fretted, "I've wasted more than an hour while you fooled around with my engine and it still won't go. I missed a client here and now it looks as if I'll miss out on that contract in Centerville. You can say I've had it."

A deflated Stan turned to Gus. "This is Mr. Miller."

"Over from Durgin?" Gus asked.

"That's me. And you're . . .?"

Gus started to answer and then thought better of it. Instead he said, "Maybe I can find the trouble for you."

Gus did a quick rundown on the plugs, checked the battery-cable terminals and the ground connections. "So far so good. Let's look at the distributor."

He removed the cap from the distribu-

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tor and inspected the contact points. "They're okay," he said. "No, wait a minute. Look here." He pointed to a nut on the side of the distributor that held the small wire leading to the coil. "By golly, that's where the trouble is." He bent to get a better look at the nut.

"You know, someone—maybe at the factory—put that nut on askew. There was nothing wrong with the coil, but when it was attached, the nut—here—that holds the wire leading from the coil wasn't threaded in properly. It jammed and the guy who installed it probably thought it was tight. But it wasn't. There's just a fraction of an inch for the connection to jump around in. That's why it goes for a while, then stops."

Stan scratched his head. "Now why didn't I see that?"

"I guess you didn't get that far when you found coil trouble. You were right as far as you went—just too ready to accept the obvious. In more ways than one," he added significantly. "Now, Mr. Miller, I think a twist of the pliers will do the trick." He removed the nut and reset it so it fitted snugly. "Stan, if you'll put back the original coil, I think Mr. Miller will be all set."

When Stan had the coil back, Gus adjusted the distributor and got behind the wheel. He started the engine, changing speeds.

"Now that's mighty sweet," Miller said. He took out his wallet.

"No charge," Gus said. "This one is on the house because we held you up."

"Well, thanks very much," Miller said. He took out a card and handed it to Gus. "Maybe you know a Gus Wilson around here. I was supposed to see him about playing at a Legion dance."

Stan's eyes bugged. "You're not *Stick* Miller, the band leader?" He gulped.

"Yup, I'm on my way to Centerville to bid on State's senior prom. Got word to stop off here to see this Wilson about the Legion dance." He glanced at his watch. "But it's so late now I won't have time to look him up. Anyway, the price he offered was too low. If you see him, tell him for me, will you?"

"B-but this is—"

"And thanks again," Miller continued, speaking to Gus. "If there's ever a favor I can do for you, let me know. You know your stuff, man."

"I'm Gus Wilson," said Gus, smiling.

"Well, I'll be . . ." He turned on Stan. "Why didn't you tell me? Why did you think I was asking for him?"

"Stan sometimes pays too much attention to the obvious," Gus explained.

"Well, no harm done," Miller conceded expansively. "And about that dance, no reason why I can't shave my price."

Gus stretched out his hand. "The Legion appreciates your generosity."

"Don't mention it. Get in touch with my agent, and he'll tell you what dates I have open." He started up the engine. "Well, all reet! That sounds more like it! So long." With a screech of rubber he was gone.

"Guess I made a fool of myself," Stan said. "When he asked for you, I thought he wanted you to take over on the job. Well, I've learned a good lesson."

"What's that?" asked Gus.

"Never judge a book by its cover—or maybe I should say, 'Dig that crazy broker!'" END

Next Month: Gus learns to count.

"Sure, we gotta make the car payments —but what about the light bill?"

Expansion downward can increase your living and storage space at low cost. Here's—

Home and Shop

The Case for the House with a Basement

By David X. Manners

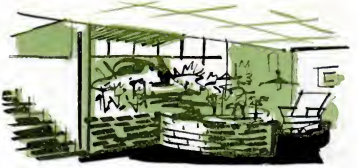
BASEMENTS have made a comeback. This year in the U. S. more than two out of three new homes will be built over them. And in the populous Northeast, four out of every five new houses will have basements. The reason: Home buyers want more space, and a basement offers it the cheapest way.

A basement can double the size of a house while adding only one-tenth to the cost. Below deck, you get space at $1 to $2 a square foot that would cost $10

Next Month: "What Cracks Can Tell You About a House." Here's the story on cracks—how you can read them to find hidden flaws in a house already built, or avoid them when you yourself build.

7 ideas you can use to make a basement livable

Except in rocky or low, wet areas, a basement is a wise investment. For only 10 percent added cost, it can double floor space. Give a basement light, ventilation and an outdoor entrance, and it will serve any purpose you wish—easing chores, adding valuable room for storage and recreation.



Indoor greenhouse? Simple: a lean-to with a slanting roof of translucent plastic.

Duplex treatment makes basement a recreation room overlooked by a first-floor balcony.

A game room has many possibilities—from darts to shuffleboard or even bowling.

to $15 upstairs. True, the space is rough, but it's far cheaper to finish, and it can be done a little at a time as the pocketbook allows.

Basement basics. If you shy away from basements as cheerless caverns with cobwebby joists and naked light bulbs, you're in the "cellar" age, says a top authority on basements-for-living, George W. Lyons Jr. As vice president of the Bilco Co., New Haven, Conn., makers of steel outside basement doors and prefab units for stairways, Lyons knows what he's talking about.

He lists three basement essentials: natural light, planned layout (utilities and storage separated from activity areas) and direct outdoor access.

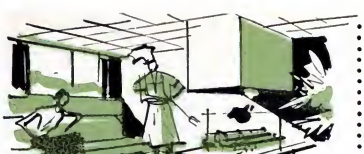
In building a new house, the basement should be blueprinted for living unless you want to shovel out good money for a hole in the ground. In buying an existing house, you should consider the basement as carefully as you would any other part of the house. But bear in mind that putting in more or bigger windows, if necessary, or adding an outside hatchway entrance, are not especially costly jobs.

With the three basics, there is no limit to the opportunities for downward expansion of upstairs family life. Your workshop can gain the status and dignity it deserves. You can have a game room, or even a swimming pool and gymnasium. A sewing center, party kitchen and barbeque, or a queen-size laundry, will lure the lady of the house. Kids can be cornered for play in bad weather and teenagers can rock and roll in noisy seclusion.

It can be a center for hobbies—photo darkroom, rifle range or radio ham shack—or the office for a small on-the-side business. And if your basement is 50 percent above grade, you can have an extra bedroom down there.

Light. In some cases a basement can become a sunroom. On a steeply sloping lot, one foundation wall is kept completely above grade and made all or mostly of glass. Faced south, it will let in the winter sun; if necessary, an overhang can be used to shade the summer sun. Then, with a walk-in greenhouse built against a part of the wall, the basement has a year-round garden-green vista.

A more down-to-earth approach is simply to have more windows. A typical six-to-nine-steps-down basement on a flat lot needs no structural alteration to accommodate three times as many windows as it usually gets. On walls paralleling the floor joists, stock 18″-by-32″ windows can be set in a continuous ribbon, using two-by-eight or two-by-ten verticals to support the first-floor plate. Even walls on which floor joists rest can take windows



A fireplace and barbecue bring the cookout indoors. Inexpensive prefabs are available.

Combining attractive basement laundry with play area lets mother watch the children.

False ceiling hides plumbing. It's made of wall panels hung from joists by pipe strap.

Large, convenient outside entrance is the gateway to year-round basement livability.

if special support is installed, such as 3″ pipe every few feet.

Larger windows are another way to achieve a brighter basement, and without sacrificing the desirable low-to-the-ground look of the house. The foundation is built two to three feet higher than normal, then graded up at the front only, using dirt excavated for the basement. This permits windows three or more feet high at the rear and sides, but gives the front the appearance of hugging the turf.

A word of warning. Window walls are traps for leaves and a nesting place for mice. If you must have below-grade windows, make the excavated area around them large and sloped away at a 60-degree angle to let in the sun. Hold the slopes with a studding of rocks and perennials. A scoop-out along one basement wall, preferably toward the south, makes a fine sunken terrace. But be sure the drainage is away from the house, not into the basement.

Ventilation. Open planning is of prime importance. Say "no" to rooms that are tightly shut off. Use louvered doors, and when possible keep partitions from going right up to the ceiling.

A house placed so that basement windows pick up summer breezes is a help, but for positive ventilation, use fans, either set in window openings or built into the stud walls above the foundation.

Dampness? It can be a basement problem, but one easily solved. Good ventilation alone often eliminates it. In other cases it yields to heat and insulation.

Planned layout. An ideal basement-for-living has utilities and storage space grouped together and isolated from recreation areas. Then, with ducts and plumbing restricted to the utility section, or recessed between joists where they can be concealed, the rest of your basement is wide open for family activities.

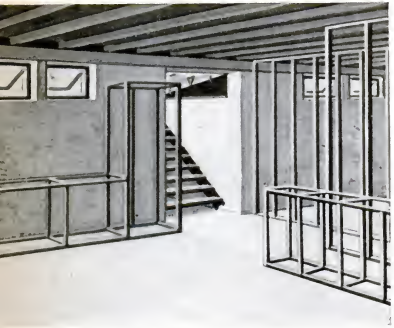
Another essential is a straight-down outside entrance, at least three feet wide. It is more than just a hatchway for lugging in and out oversize equipment and materials. By satisfying all service needs, it frees the inside stairway from chores. This can now lead directly from the living room to the recreation area, and be designed for upstairs attractiveness and convenience.

Downstairs decoration. Where whitewash was the standard décor for the old-fashioned "cellar," today's better basement lends itself to almost any decorative scheme.

Panels of translucent plastic, spotlighted from behind, make dramatic, glowing walls. On the other hand, ordinary corrugated cardboard, nailed to furring strips and covered with wallpa-

Three steps to a useful basement

1 Basic elements—light, a direct outside entrance, open layout—start you off.



2 As you decide what you want of your basement, put in the framing, a bit at a time.

3 Finishing can be done as your pocketbook allows, or timed to your leisure hours.

per, needs no apology. If a hole gets punched, just patch it and who cares?

Underfoot you can have the upper-level luxury of vinyl floors, thanks to a special new adhesive, or a wood floor laid over a grid of two-by-fours set in mastic. If you want carpets or drapes, there are new synthetics that don't mold or mildew.

Lightweight partition frames for hardboard, plywood, plastics, bamboo or a variety of other decorative materials are cheap and easy to build. Made of one-by-fours in modular four-foot widths, they can be joined by dowels or wingnuts to form walls, or be suspended from the ceiling.

Lally columns, instead of being a problem, can be used to advantage. Where they can't be concealed in closets or by partitions, use them to support storage units or dividers. They can be pegged for climbing in the children's play area, used as a clothes rack, wound with rope, covered with half-round bamboo, painted with barber-pole stripes.

Basement bonuses. Extra living and storage space are not the only advantages. There is more pay dirt.

- The basement has always been a comfort, warm in winter, cool in summer, and it passes this tempering influence on to the house. On a frosty morning, even without the furnace on, it will warm the floors above. On a hot summer day when the ground-level temperature reads 90, the mercury six to nine steps down may read 55. If the furnace has a blower to circulate the air upstairs, you have a cooling system.
- Plumbing and heating units are more accessible, repairs lower. In areas of termite infestation, a full basement makes an excellent barrier. A basement, by sealing the house off from the ground, eliminates a source of first-floor dampness.
- Better mortgages can usually be negotiated for a house with a basement, and taxes are generally lower on basement space.
- With a basement, chances are that you'll get a better foundation, for it will go deeper. The house is less likely to settle unevenly, with resulting sagging of floors and cracking of plaster.

As one architect puts it, "Whatever you spend on the rest of a house, you can't beat the value you get in the bargain basement." END

OUT OF THE CELLAR CLASS: Light and air from outside make the big difference. Here, special supports for the first-floor joists make possible wide windows along two foundation walls.

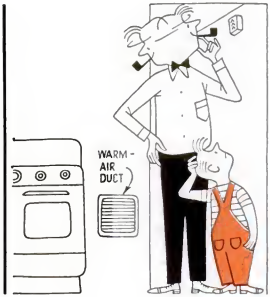
Safe outside stairs—a solid start toward basement dividends

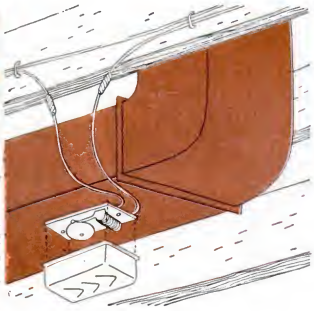
TODAY, with basements fast becoming extensions of upstairs living, the stairs must be both safe and attractive—especially the outside steps, those traditionally dangerous eyesores.

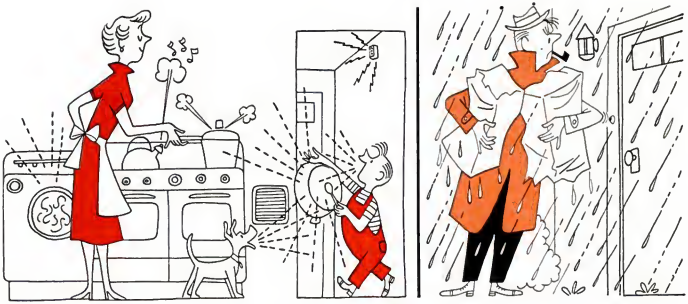
Now on the market are galvanized-steel stair stringers made by the Bilco Co., New Haven, Conn. Easy to install, the stringers, notched to take two-by-ten wooden treads, are anchored to the concrete sides of a foundation hatchway with hardened-steel nails. The treads can be removed for easier handling of bulky objects such as a fuel tank or a piano.

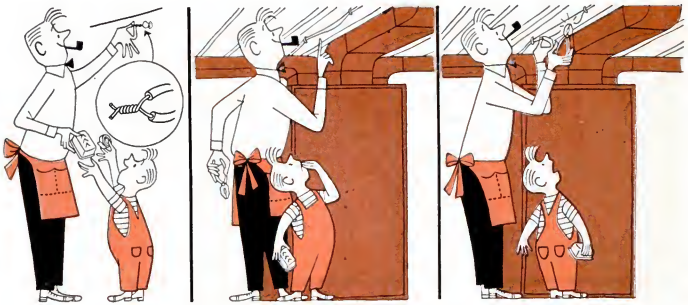
Wordless Workshop

By Roy Doty
and C. T. MacFarlane









Next Month: An elevator shelf to store things in a cramped garage

Crutch-Tip Pad on C Clamp

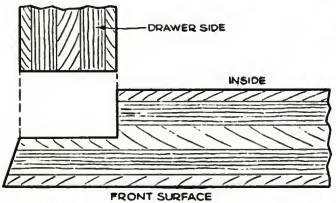
UNLESS you let the jaws of a C clamp chew into the work, you know the juggling it takes to place pads under them while manipulating both work and clamp.

But slip a crutch tip over the screw end, and it's no job at all to hold a pad under the fixed jaw while you tighten on the work.—*Frank A. Javor, Newark, N. J.*

How to Dry a Film-Tank Reel

AFTER developing a roll of film, you can't use the reel again until you have dried it thoroughly.

A simple, efficient way to dry such a reel is by centrifugal force. Chuck the handle of the reel in the drill press and flip the switch. Within seconds the reel will be dry.—*Jack Eisner, Flushing, N. Y.*



Invisible Plywood Drawer Edge

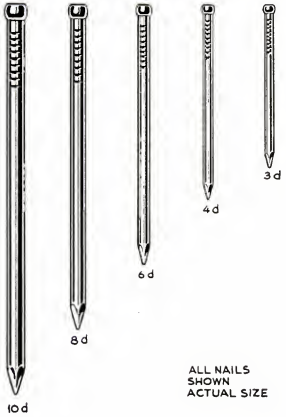
I USE a simple dodge to get neat corners on plywood drawers. Instead of making a right-angle cut at either end of the drawer face, I slant the cut inward 20 degrees so the plywood laminations are less exposed when the drawer is opened. Rabbets are cut to the center of the middle ply.—*N. M. Pittmann, Overton, Tex.*

Scratchproofing Chair Legs

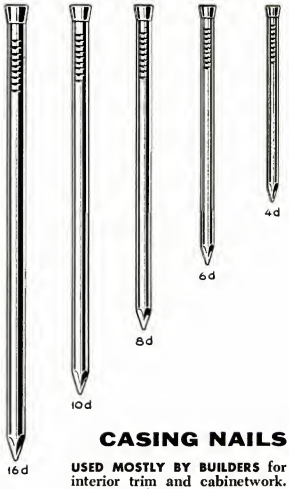
CHAIR legs won't scratch linoleum, tile or varnished floors, or skid on smooth surfaces, if the bottoms are coated with plastic rubber. Apply a layer 1/8" thick and let it dry at least 24 hours.

You can do the same thing with metal casters to give them an easy-roll rubber tread.—*Ken Murray, Colon, Mich.*

Finishing-Head Nails



ALL NAILS SHOWN ACTUAL SIZE



FINISHING NAILS

USED FOR DECORATIVE WORK where heads must be concealed or flush with work surface. Some have cupped heads which make them easier to countersink and cover over with wood putty.

CASING NAILS

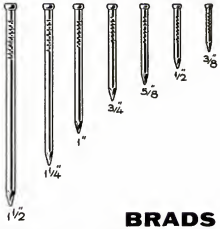
USED MOSTLY BY BUILDERS for interior trim and cabinetwork. Though slightly heavier in gauge than finishing nails, they are so similar that they are seldom stocked by retail dealers.

FINISHING NAILS

Size	3d	4d	6d	8d	10d
Length	1⅓"	1½"	2"	2½"	3"
Gauge	15½	15	13	12½	11½
Quantity per lb.	875	600	309	196	125

CASING NAILS

Size	4d	6d	8d	10d	16d
Length	1½"	2"	2½"	3"	3½"
Gauge	14	12½	11½	10½	10
Quantity per lb.	485	245	149	94	75



BRADS

SMALLER AND THINNER than finishing nails (16 to 20 gauge), they are used for light assembly where heads must be concealed. Sold by length rather than penny sizes in ¼- or 1-lb. boxes.

Filing the Facts

NOW you can save, permanently, in easy-reference form, those valuable home-repair pages you find every month in POPULAR SCIENCE. A handsome, durable binder is now available to readers. It is designed particularly to hold the tear-and-file pages of the Home Owner's Section. The section, in turn, is designed for easy organization (Fix-It File, Materials File, Know-How File). Under these headings in your binder, you can also save other PS articles of special interest to you.

To get the binder above send $2.50 and your name and address to: **Magazine Services, Inc., Dept. B-958, 104 East 26th St., New York 10, N. Y.**

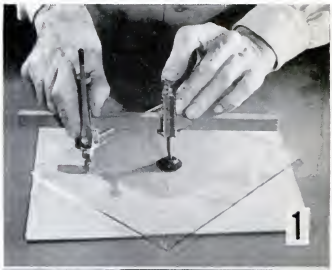
Cutting Glass Disks

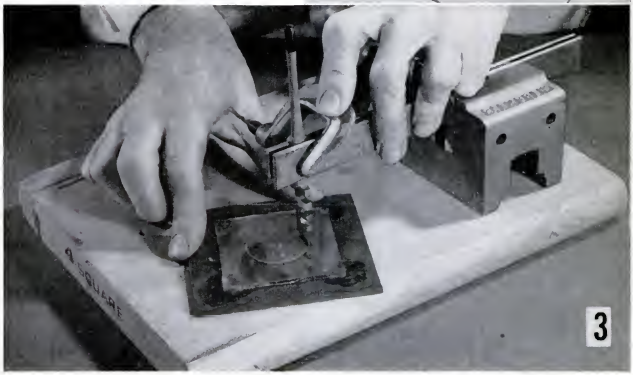
TO CUT a replacement disk of glass for a clock, flashlight or round picture frame, all you need is a cutter and some means of guiding it in a circle. You can:

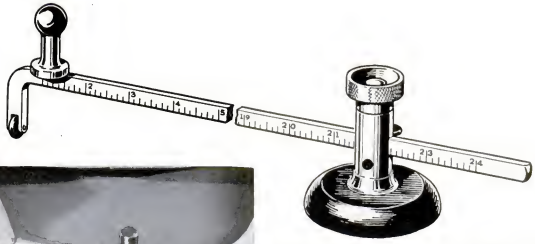
1. Lock the cutter in the pencil leg of a carpenter's trammel-point set and swing the centerpoint from a suction cup stuck to the glass. Dip the cutter in kerosene. When cutting, press down firmly and be sure you complete the circle. If the cutter tends to skip, it's probably dull and should be replaced.

2. Rig a homemade trammel by pivoting a strip of hardboard on a screw-fitted suction cup (you can buy them in auto-supply stores). Clamp the cutter to the strip at the required radius.

3. Use beeswax to stick the glass to a turntable pivoted on a wood screw in a wood base. Clamp the cutter to a wood strip held in a vise and press down hard with the tool while you rotate the turntable. Bolt the vise to the base so it can't slip. This is the best way to cut small-







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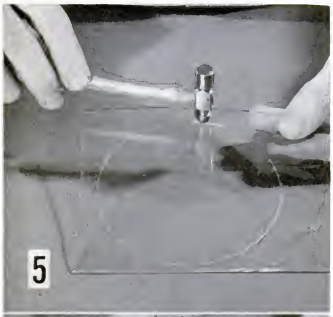

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diameter disks—and probably the simplest way to cut disks of any size.

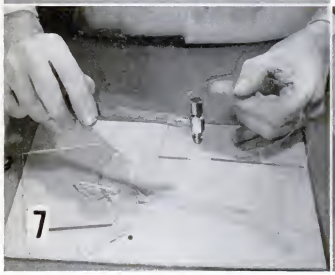
4. For about $5, you can buy a professional glass-disk cutter mounted on a heavy-duty suction cup. The one sketched cuts circles from 2″ to 24″ in diameter.

After scoring the circle, turn the glass over and tap all around the score (5) to deepen the fracture and make separation easier. It's difficult to see the fracture deepen, so have faith and tap gently.

Reverse the glass and scribe random radial lines from the circle outward, to the edge of the pane (6), to make it easier to break off the waste.

Tap the glass just outside the scribed circle (7) and the waste will break off in pieces. If any fragments remain, use pliers to snap them off in small bits.

Smooth the rough edge (8) by rubbing the disk on a sheet of fine-grit abrasive cloth that's backed up with a strip of leather.



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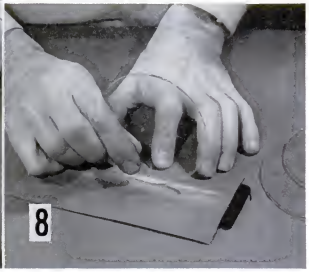

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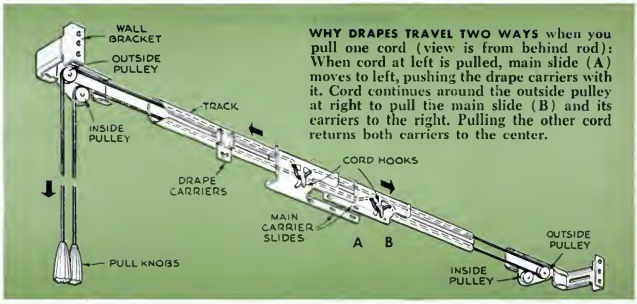
Traverse Rods

fix-it file

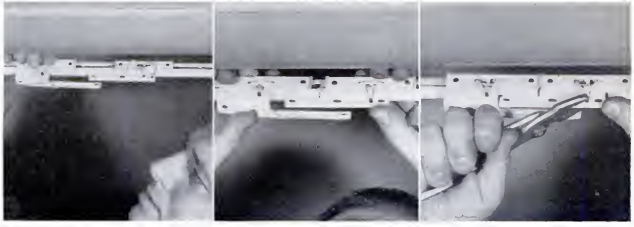


WHY DRAPES TRAVEL TWO WAYS when you pull one cord (view is from behind rod): When cord at left is pulled, main slide (A) moves to left, pushing the drape carriers with it. Cord continues around the outside pulley at right to pull the main slide (B) and its carriers to the right. Pulling the other cord returns both carriers to the center.

What to do when drapes won't draw easily

FREE STICKING SLIDES by lubing track with a stainless grease stick or soap. Smooth rough spots with emery cloth and apply one drop of light oil to pulleys. Remove any unused drape carriers (center photo); they can cause jamming. Some rods have a slot for easy removal of carriers, others must be separated to slide carriers out. Use weighted pull knobs to keep cord taut, or coil solder inside existing pulls to weight them.

How to center uneven drapes



UNHOOK THE PULL CORD from both main carrier slides (left) and bring the slides together at a pencil mark made at the exact center of the rod (middle photo). Adjust pull cords to proper length at side, then slip cord under hooks and bend them tightly over the cord (right) to prevent slippage. Test slide travel before hanging drapes.

How to install a new pull cord

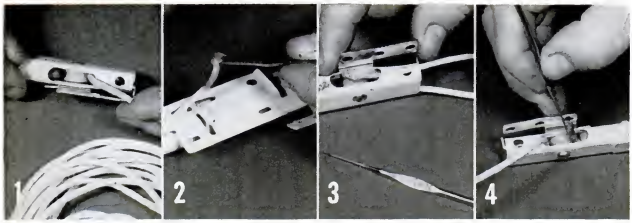
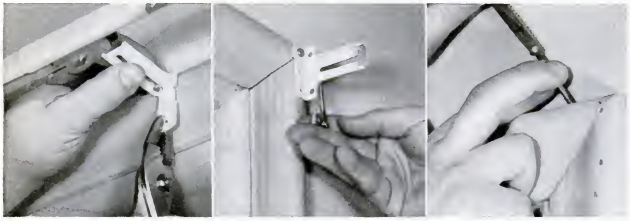


FIGURE LENGTH OF CORD like this: For rods up to 6′, double the rod length plus 9′; rods over 6′, triple the rod length plus 3′. For easier threading, dip cord end in melted candle wax. Start cord over outside pulley (1), then in and out of double slots in nearest main slide (2). Thread cord over and around pulley on opposite end (3), in and out of slot in remaining main slide (as in 2), over the *inside* pulley at the starting end and out (4). Center the main slides and bend hooks over the cord to secure them.

Three cures for a sagging rod



INSTALL A SUPPORT BRACKET at center of the rod (left) where it won't interfere with slides. Bend it if necessary to fit curved molding. Replace short screws in end brackets with new ones long enough to reach studs (center). If molding is loose, tighten the corners with screws driven diagonally in drilled pilot holes as shown at right.

Tips on installing new rods

FASTEN BRACKETS RIGIDLY by one of the three methods shown at left. Use an old metal drill to make holes in plaster. Where rod overlaps window, and end brackets are fastened to wall, add over-arm brackets at the molding for extra support (center). Secure extender plates with four screws (right) driven through to the stud if possible. Shape a wood shim to fit under brackets on curved molding and drive screws through it.

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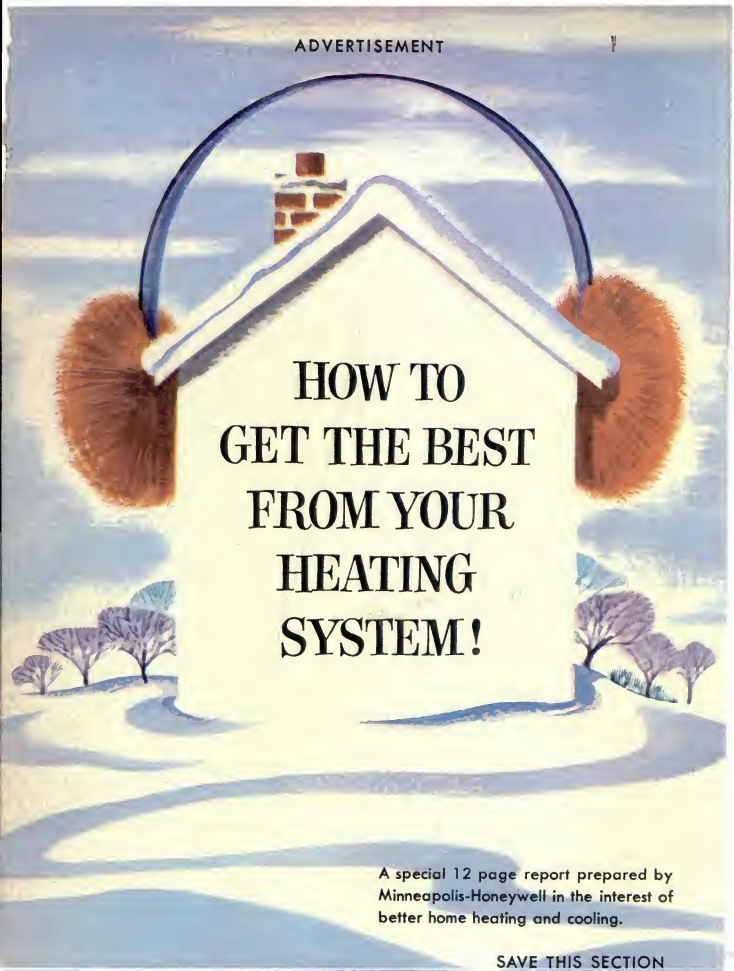

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How this booklet will help you

LIKE MANY another modern aid to comfortable living, an automatic central heating system is easy to take for granted. But you may be money ahead if you don't.

Look at it this way. If your house cost $15,000 and has a first-rate heating system, chances are that system represents about six percent of your total investment. (After 20 years you'll have spent roughly another $1600 to $4200 just for fuel, not counting maintenance costs.)

All in all, a sizeable sum, spent for comfort, health, peace of mind. And a bargain, of course, if you get what you pay for.

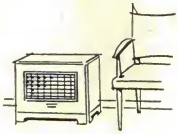
But how can you tell? What makes a good heating system? Are fuel and maintenance costing you too much? If so, what can you do about it?

You'll find the answers in this Honeywell booklet. And you'll find it profitable to read. The key to getting the best from your heating system lies in learning as much as you can about its operation. These basic principles won't make you an expert. But they will help you improve the performance of your present system; help you evaluate the system in a home you're planning to buy; save money on fuel and repairs; and perhaps help you avoid a miserable couple of hours on the coldest day of the year.

2

It takes all kinds

A WEATHER station at International Falls, Minnesota, logs an average of 198 days below freezing each winter, while in parts of the South and Southern Pacific Coast it's a rare winter that brings even one freeze. Obviously then, heating requirements for any locality are determined by extremes of climate, and there's a type of heating to match any extreme.



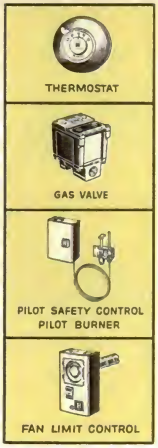
Room heaters, wall furnaces and floor furnaces are generally found in smaller homes or where individual rooms are heated separately. Being smaller, less complex and expensive than a central system, they represent a smaller percentage of the total home investment. Properly installed, they very adequately do the job they were designed for.

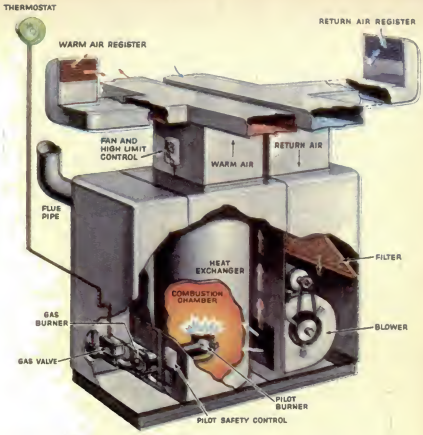
Central heating plants consist usually of a single unit big enough to heat an entire house. It is capable of distributing the heat through ducts or pipes to registers or diffusers (warm air), convectors or radiators (hot water or steam) located in each room. Central heating is becoming the most common type of installation, since a majority of families live in a climate that makes it practical.

A central heating system may burn any fuel—coal, coke, oil or gas. Or, in some regions, electricity is gaining in popularity for heating. Most automatic central heating systems today, however, burn either oil or gas and transfer the heat generated to one of two mediums, air or water. The heated medium, air, water, or steam, is carried throughout the house either by gravity, or by forced circulation. Gravity systems, of course, are designed on the principle that the medium tends to rise or expand when hot, descend or condense when cool, creating a cycle.

CENTRAL HEATING	
OIL	GAS
Warm Air Hot Water Steam	Warm Air Hot Water Steam
DISTRIBUTION	
GRAVITY	FORCED
Warm Air Hot Water Steam	Warm Air Hot Water Steam

Four of the most common automatic central heating systems in use today are: (1) gas-fired warm air, (2) gas-fired hot water, (3) oil-fired warm air and (4) oil-fired hot water. The difference between two systems using the same medium—hot water, for example—lies in the type of fuel used and the controls which regulate this fuel. Gas burners require supervisory controls that differ from those needed for oil burners.



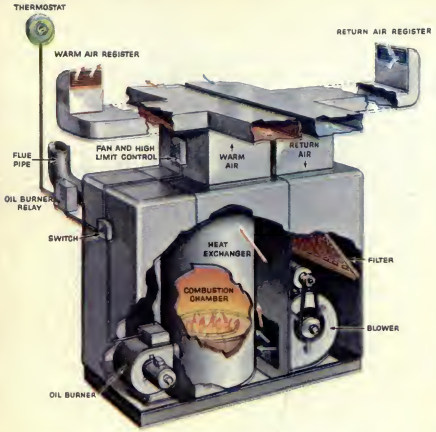


Forced Warm Air System—Gas Fired

Normal Operating Cycle—*Thermostat* contacts close when room temperature drops below the thermostat setting. This opens the *gas valve* and releases gas through the main burner into the *combustion chamber*. *Pilot burner*, which is always lit, lights main burner. *Fan control* senses temperature in furnace and when it has reached "fan on" setting, starts the blower. *Blower* pulls cooler air from rooms through return air system (return air registers, return air ducts and filter) and forces it around the *heat exchanger*. As cool air passes outside heat exchanger, it picks up heat from heat exchanger surfaces and delivers it through the ductwork to the *warm air registers* in each room. Combustion gases are vented directly through the flue pipe to the outdoors. They must never come in contact with room air.

During this operation two safety controls guard the system. The *pilot safety control* uses a flame detector element protruding into the pilot flame to make sure that pilot flame is "on" and is strong enough to light the main burner. If the pilot flame is unsatisfactory for safe lighting, the pilot safety control will prevent the gas valve from opening. The *high limit control*, often combined in the same case with the fan control, senses the furnace temperature and shuts down the main burner if unsafe temperatures are reached.

3

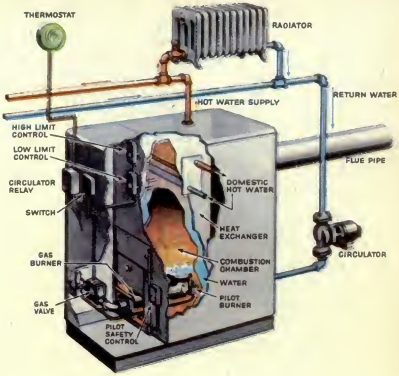


Forced Warm Air System—Oil Fired

Normal Operating Cycle—*Thermostat* contacts close when room temperature drops below the thermostat setting. This energizes the low voltage *oil burner relay* which starts the burner motor operating the oil pump which pumps atomized oil into the combustion chamber. A high voltage spark ignites the oil in the *combustion chamber*. *Fan control* senses temperature in furnace and when it has reached "fan on" setting, starts the blower. *Blower* pulls cooler air from rooms through return air system (return air registers, return air ducts and filter) and forces it around the *heat exchanger*. As cool air passes outside heat exchanger, it picks up heat from the heat exchanger surfaces and delivers it through the ductwork to the *warm air registers* in each room. Combustion gases are vented directly through the flue pipe to the outdoors.

During this operation two safety controls guard the system. One of them is most often part of the *oil burner relay*. If oil burner doesn't ignite in the first 90 seconds, oil burner relay automatically shuts the system down. The other is the *high limit control*, often combined in the same case with the fan control. It senses furnace temperature and shuts down the main burner if unsafe temperatures are reached.

Note: Gravity warm air systems are similar to these forced warm air systems except that they depend upon gravity to circulate air through the heating system. Therefore they have no blower, fan control or filter.



Forced Hot Water System—Gas Fired

Normal Operating Cycle—*Thermostat* contacts close when room temperature drops below the thermostat setting. This opens the *gas valve* and releases gas through the main burner into the *combustion chamber*. *Pilot burner* lights main burner. *Thermostat contacts* closing also starts line voltage *circulator* by energizing low voltage *circulator relay*. Circulator forces water through the boiler *heat exchanger* where the water is heated. The hot water is then forced through the distribution pipes to room radiators, convectors or other forms of hot water heating units.

Two safety controls guard the system. The *pilot safety control* uses a flame detector element protruding into the pilot flame to make sure that pilot flame is "on" and is strong enough to light the main burner. If the pilot flame is unsatisfactory for safe lighting, the *pilot safety control* will prevent the gas valve from opening. The *high limit control* shuts down the burner if unsafe boiler temperatures are reached.

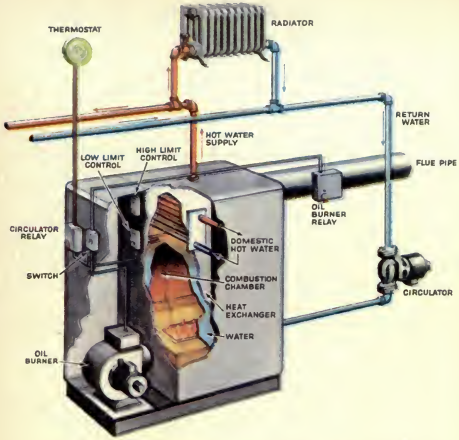
Note: Gravity hot water systems depend upon gravity to circulate water through the heating system. They have no circulator, circulator control or circulator relay.

DOMESTIC HOT WATER—Some systems use the heating plant boiler to provide hot water for daily household use. If so, the following controls are also included:

Low Limit Control—operates burner to provide domestic hot water.

Circulator Control—prevents circulator from operating if boiler temperature is not high enough to supply both domestic hot water and heating systems.

On newer boilers, one or more of these controls may be combined with the high-limit control.



Forced Hot Water System—Oil Fired

Normal Operating Cycle—*Thermostat* contacts close when room temperature drops below the thermostat setting. This energizes the low voltage *oil burner relay* which starts the burner motor operating the oil pump which pumps atomized oil into the combustion chamber. A high voltage spark ignites the oil in the *combustion chamber*. Thermostat contacts closing also starts line voltage *circulator* by energizing low voltage circulator relay. Circulator forces water through the boiler heat exchanger where the water is heated. The hot water is then forced through the distribution pipes to room radiators, convectors or other forms of hot water heating units.

Two safety controls guard the system. One of them is most often part of the *oil burner relay*. If oil burner doesn't ignite in the first 90 seconds, oil burner relay automatically shuts the system down. The *high limit control* shuts down the burner if unsafe boiler temperatures are reached.

DOMESTIC HOT WATER—Some systems use the heating plant boiler to provide hot water for daily household use. If so, the following controls are also included:

Low Limit Control—operates burner to provide domestic hot water.

Circulator Control—prevents circulator from operating if boiler temperature is not high enough to supply both domestic hot water and heating systems.

On newer boilers, one or more of these controls may be combined with the high-limit control.

The inside story

Then...

How they work—Today's thermostats are a far cry from those of a few years ago both in beauty and in brains. Because of smaller, more sensitive bimetals (the magic metal sandwich explained below) they respond more quickly to temperature changes of just a fraction of a degree.

Also a small heating element has been added to raise the temperature within the thermostat casing whenever there is a call for heat. Thus, the heating system is shut off before the desired temperature is reached—but *just enough* before so that the heat on its way up from the furnace or boiler will bring temperature up to the desired point. Overheating is eliminated and so is the old, too cold-too hot cycle.

A major mechanical improvement is the use of the newly designed hermetically sealed mercury switch. It responds instantly, practically never wears out and its hermetic seal prevents dust from insulating the electric contacts. Formerly dirty contacts in older thermostats prevented the system from going on.

The Magic Metal Sandwich

The BIMETAL commonly used in thermostats and other controls appears to be one strip of metal, but is actually two strips of metal fused together. These metals differ widely in their response to temperature change. As temperature becomes higher one metal expands much more than the other, causing the bimetal to bend.

In thermostats, this bimetal action opens and closes a low voltage electrical contact to turn your heating system off and on. In the most modern thermostats the bimetal is coiled like a spring and the contacts are within a hermetically sealed mercury switch.

THERMOSTAT LOCATION	
RIGHT	WRONG
Mounted in living or dining area in the path of natural circulation.	Behind doors, furniture or drapes or in cold drafts (from an open door).
On an inside wall about five feet from the floor and easily accessible.	Near outside wall, fireplace, or in direct rays of sun.
Mounted in a location between wall studs.	Near concealed pipes, ducts or unusual sources of heat such as radio, TV, lamps.

Is your thermostat properly installed?

Where your thermostat is, has a lot to do with how well it works. And the chart at left gives you a few dos and don'ts about its location. They're important to know if you're having a new system installed or remodeling your house. They're important too, if your wife has just ordered the furniture moved. One family discovered to its dismay that a rearrangement of furniture resulted in everyone getting cold feet. The cause? They'd moved the heat-generating TV set right under the thermostat.

5

of thermostats

How to set them—There are a few things you should know to help your thermostat serve you better. One of them is that its location is important. That's explained in another section on these pages. Another is that the thermostat only turns the heating system on. It doesn't regulate the volume of heat. Assume your thermostat is set at 68°. Turning the thermostat up to 80° won't cause your home to heat up any faster than merely advancing it to a more normal 72° or 74°.

Still another important thing to remember is that a fixed indoor temperature does not mean you'll be comfortable. When the walls of your house get cold, your body loses heat to the walls at a faster rate and you require a higher setting on your thermostat than normal to be comfortable.

So watch the weather and adjust your thermostat accordingly. Or, have one of the new indoor-outdoor thermostat systems (explained below) installed to watch the weather for you.

and now

The famous Honeywell Round shows new beauty and precision of today's thermostats. Easily painted to match your walls.

The outside story of thermostats

A New Idea Gives You More Comfort Whatever The Weather. When a sudden drop in temperature turns the walls of your house colder, they "draw" increasing amounts of heat from your body. So you feel colder even though your thermostat is set at the temperature you normally like best. Just the reverse happens if it suddenly gets warmer outside.

A new inexpensive indoor-outdoor temperature control puts an extra thermostat outside your house to sense any changes in outdoor temperature, wind or sun rays. It signals this information to your indoor thermostat which automatically adjusts its setting accordingly. If it suddenly gets colder outside, your thermostat raises its setting before your walls get colder. *You* never feel the change because your thermostat *did* and acted quickly and automatically.

This is just one of the many new types of thermostats available. For instance: a year-round thermostat controls heating in winter, cooling in summer; an electric clock thermostat turns down heat at night, up in the morning—automatically; and used in an indoor-outdoor thermostat system, it gives you automatic night setback *plus* weather anticipation.

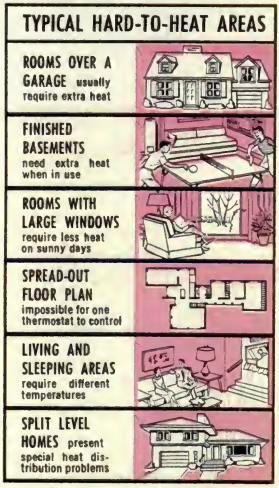
Know your heat distribution

Whatever kind of system you have, the distribution system must be put together right to insure comfort. That's why your heating and air conditioning contractor is so important. He produces the heating system in your home, sizes ductwork or pipes for heating load and balances your system so that every room gets heat for perfect comfort.

Forced Warm-Air Systems—In forced warm-air systems your heating and air conditioning contractor uses ducts and registers to make up your distribution system. Supply registers should be located properly to suit your floor plan. You should feel a gentle flow of warm air coming from your supply registers when your fan is running. If you don't, the damper may be closed, your filter clogged, or your system may need rebalancing. You can open the damper at the register, change or clean the filter yourself; but if your system needs rebalancing, call your contractor.

Hot Water Systems. There are several methods of distributing heat in hot-water systems. Only your contractor can determine which is best for your home and climate. Whatever type is used, it should be properly sized and located in your rooms. Hot water systems require balancing done by your contractor with balancing cocks in the pipes or radiator valves. If certain rooms are too hot or too cold your system may need rebalancing. Call in your contractor.

Zone Control: Solution to problem area heating



EVEN with a good distribution system, perfectly balanced, you sometimes can't achieve the kind of comfort you want with just one thermostat. In fact some of the floor plans of newer homes create special heating problems, as the chart at left illustrates. Zone control can help you overcome these problems.

Zone control divides your house into zones, with a thermostat in each to make certain that zone gets the temperature you desire. It doesn't have to be expensive either. In some installations a simple modulating damper in the furnace plenum plus the two thermostats will do the job. Or it may be that an additional thermostat and circulator is all that need be added. Sometimes zoning may be achieved more economically with two furnaces or boilers.

Your heating and air conditioning contractor can tell you which method is best for your home. In any event, the extra comfort and the extra savings you get will be well worth the additional cost.

The care of your system

YOU needn't pamper a good heating system to keep it functioning well. But there are a few things you should do. In hot-water systems, vent the radiators every fall and oil your circulator every three months. In forced warm air systems, change or clean your filters two or three times a year and oil your blower and blower motor.

You can also check your system occasionally to see if it's functioning well. If you have an oil burner, check for soot in your combustion chamber. If there is a layer of black soot, the fuel and air mixture is incorrect. Call your contractor.

If your blower doesn't run during most of the day in the heating season, lower your fan setting to get more nearly continuous fan operation. This gives better distribution and eliminates cold air layers.

Probably the most important thing you can do to keep your heating system functioning well is to have it checked once a year by your heating contractor or dealer. He knows best how to maintain your heating system for comfort, long life and efficiency.

6

How you benefit from a system with matched controls

THE HONEYWELL ROUND*
for all systems
world's most beautiful —and popular—thermostat.

PILOTSTAT*
and pilot burner
for gas-fired system protects against unsafe conditions caused by pilot failure.

GAS VALVE
For gas-fired system. Silent, trouble-free, fast response.

TRIPLE-FUNCTION AQUASTAT*
For hot-water systems. Combines low limit, high limit, circulator control and circulator relay.

PROTECTORELAY*
For oil-fired system. Starts and stops burner, controls ignition, checks combustion for safety.

FAN LIMIT CONTROL
For forced warm air systems. Cycles fan when properly heated air is present. Shuts off burner if furnace gets too hot. *Trademark

WITH very few exceptions, you should never touch any of the controls on your furnace or boiler. High limit settings, for instance, are set by your contractor according to manufacturers' recommendations to comply with building and safety codes. They should be left exactly the way they are.

There's one thing you can do about the controls on your heating plant though. Insist that all the controls be products of the same company that made the thermostat on your wall.

This is essential because every control in your heating system influences the operation of at least one other control. For example, the thermostat operates the gas valve or oil burner relay, and the thermostat heater must be accurately matched to the electrical power consumed by that control. Therefore make sure that all the controls on your heating plant are designed and matched to work together by insisting that they are all quality controls made by the same manufacturer.

If your contractor puts the famous Honeywell Round, shown at left, in your living or dining area, make sure all the controls on your heating plant are also made by Honeywell. You'll recognize them by the trademark H. And when you do, you'll know you have the very finest in automatic controls for your heating system.

What about complete year-round air conditioning?

YOU soon may want to add central air conditioning. It can be added at a reasonable cost to almost any kind of existing heating system.

Complete year-round air conditioning has many benefits, too—including not only heating and cooling, but dehumidifying in summer, and humidifying in winter. It also provides air circulation, fresh air intake and air filters (preferably electrostatic filters which remove 90% of air-borne dirt).

Your heating and air conditioning contractor will gladly supply complete details on year-round air conditioning for your home. Or you can write Honeywell PS-9-15, Minneapolis 8, Minnesota, for a free 24-page booklet on residential air conditioning—"Practical Answers to Common Questions About Central Air Conditioning."

SAVE THIS SECTION! KEEP IT NEAR YOUR HEATING PLANT!

What to do if your system fails

If the failure shuts down your heating plant, and the cause is minor, you sometimes can easily and safely correct it yourself without calling a trained serviceman. And sometimes when a serviceman must be called, there are things you can do to keep your heating plant operating temporarily until the serviceman arrives:

Whenever possible, refer to the heating plant manufacturer's manual for guidance. If your system was installed in recent years you should have one on your furnace or boiler, or you should be able to get one from your heating contractor or manufacturer.

If you don't have a manual, this page will be a partial guide.

OIL-FIRED SYSTEMS

1. Check tank for fuel; you may simply have run out of oil.

2. Check fuses. They may be loose, making no contact, or blown out. If the oil burner is on a separate circuit and fuse is blown, call a serviceman. If burner is *not* on a separate circuit, try a new fuse. If it blows a second time, call a serviceman.

GAS-FIRED SYSTEMS

1. Check to see if pilot burner is lit. If it isn't, carefully follow instructions on your heating plant for relighting. If pilot burner goes out again after a short time, call your heating contractor or service man.

FORCED WARM AIR SYSTEMS

1. If your heating plant seems to be operating normally, but the room temperature takes too long to reach thermostat setting, or is consistently below thermostat setting, the filter may need cleaning or replacement.

WARNING! For Professionals Only!

1. Don't try anything not suggested above or in your manufacturer's manual.

2. Don't try to make internal thermostat adjustments.

3. Don't tamper with the limit controls. They should be set by the installer and left alone.

4. Don't change blower speed or combustion air setting; don't tamper with any control wiring.

Honeywell

First in Control

WHERE TO GET HELP! (Fill in below the name and address and phone number of your heating and air conditioning contractor or serviceman. Keep near your furnace or boiler, or near your telephone.)

NAME_____

ADDRESS_____

TELEPHONE (Day)_____ (Night)_____

How You Can Use Built-Ins

YOU profit in two important ways from built-ins. You make the best possible use of the space in your home—and you save money.

Because built-ins take the place of furniture, money spent for built-ins is *money you don't have to spend* for furniture. Price any good built-in; then price the piece of furniture that does the same job, or that gives you an equal amount of storage, and you'll find that the built-in usually

HOME IMPROVEMENT COUNCIL

A Timely Roundup of Money-Saving, Space-Making Ideas for Improving Your Home

puts you considerably ahead financially. It does this while enhancing the value of your home from the standpoint of convenience.

Built-ins are an asset to any house—as more home owners are learning every year. In the first phase of the home-improvement contest being conducted by the Home Improvement Council, nearly three-fourths of the entrants said they wanted new built-ins. Taking the cue, POPULAR SCIENCE chose built-ins as this year's theme for the home-improvement campaign that it makes each year in cooperation with the National Retail Lumber Dealers Association.

The choice reflects a simple fact: Built-ins have become today's biggest idea in home improvement. Besides saving space and money, the home owner and his family gain extra living, often a new *kind* of living, in each square foot of space. Later, if the house changes hands, they are paid again, in higher resale value.

What's really behind this swing toward built-ins? As a noun, the word "built-in" is hardly a dozen years old. But the space-saving aspect of built-ins is so basic that you can trace it through the history of home planning:

- Two-thousand-year-old Pompeii is a city of nooks and crannies engineered in stone: recessed sleeping alcoves, built-in ovens, hot-water conduits concealed beneath the paving.
- In medieval Europe, whole families fitted into one- or two-room cottages, thanks to built-in beds, benches, chests and cupboards.
- Williamsburg, Va., and many New England towns are museums of early American built-ins: nests of drawers lining the walls of a dining room; shelves recessed over a living-room mantel, fitted with sliding doors so the housewife could conceal the family porcelain or show it off.
- Thomas Jefferson's Monticello home has a pair of dumbwaiters built into a fireplace—on one side of the hearth to bring bottles of wine up from the cellar, on the other to shuttle empties down. The third President wasn't just being quaint; he was coming close to the modern, post-World War II concept of what makes a good built-in:

All built-ins are space-savers, but the best nowadays (like Jefferson's) yield some other bonus besides. Here are just five of the many different purposes that can spark the imagination of today's built-in-minded home planners:

1. Upgrading an "awkward" area into useful living space. Every home has an inconveniently shaped or sized space waiting for a built-in to change its dimensions from oddity to asset.

That area beneath a staircase, for example: In many homes it's 100 percent wasted; in others, it has been converted into a closet that, with its scant headroom, really pleases nobody. A built-in-conscious home owner might eye that space and decide it will serve far better as bookshelves, a phonograph installation, a fold-out desk or a recessed telephone-and-table unit.

An attic can illustrate this same principle of upgrading an inconvenient space. Modernized by built-ins that don't ignore but instead make use of its sloping ceiling, a head-bumping, dismal catch-all of an attic can become anything from a den to a sewing room.

2. Concentrating and camouflaging a utility area. This now-you-see-it-now-you-don't principle has applications that vary with each family.

Putting today's more elaborate laundry area behind partitions—to take just one example—keeps it out of sight, while encouraging a logical, step-saving arrangement of the appliances involved. The same can be true of a built-in home workbench, darkroom—or any other

[*Continued on page 240*]

N R L D A

Annual Fall Home Improvement Program

Do away with crowded closets. Improve your home! Increase the everyday convenience of your house from top to bottom.

Visit your local Lumber Dealer during the Fall Home Improvement Program and talk to him about Built-Ins for your home.

Your neighborhood Lumber Dealer is participaing in a gigantic program designed to help you with all of your improvement plans. He'll be happy to show you "How You Can Use Built-Ins" in your home. . .give you estimates. . .how-to-do-it advice. . .recommend a reliable, local contractor to work with you.

A seemingly endless variety of ideas and ways to save dollars will flow from your Lumber Dealer; how to remodel a garage into a playroom. . .how to add an extra room, paint, insulate, re-wire and a host of other suggestions.

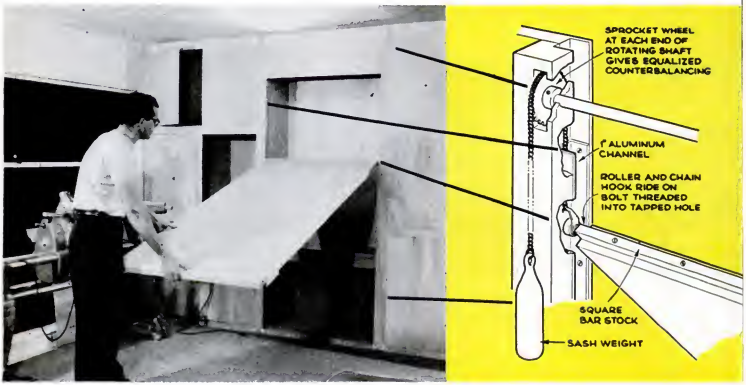
Participate in this nation-wide Fall Fix-Up Program for 1958.

For tools, equipment, materials, advice and prompt service—it pays to see your Lumber Dealer first. He'll save you $$$.

HOME IMPROVEMENT COUNCIL
Better Your Living

N R L D A
National Retail Lumber Dealers Association
18th & M Streets
Washington 6, D. C.

A Picture Gallery of Modern Built-Ins



Complete dining room in a wall cabinet

EVERYTHING FOR ELEGANT DINING—china, glassware, silverware—there's even room for folding chairs—is within arm's reach in cabinets surrounding this pull-out table. Closed, table becomes center of what looks like a wood-paneled wall—no hardware or hinges visible. Opened . . .

TROPICAL FISH AND IVY add interest to this room divider that fits almost any setting. The aerator, light and filter for the fish tank are serviced through a removable panel on the far side of the divider. Florist's planter boxes set in a recessed trough provided in the top of the divider hold sufficient rich earth to sustain the growing plants.

. . . it seats seven comfortably and can do for nine. Fold-together legs support the outer end of the table; stops support concealed rollers on the sash-balanced inner end (see drawing). A built-in ornamental figure in an illuminated recess decorates the dining area without stealing space from the table. Two 60-watt bulbs in a light-box covered by a pane of frosted glass set flush with the table top provide soft, indirect lighting for relaxed dining.

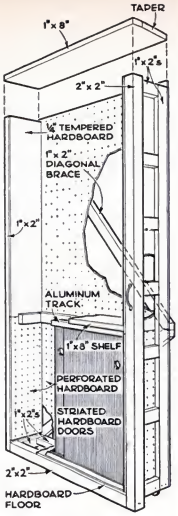
A VANITY BAY is created by building floor-to-ceiling clothes closets on each side of a large bedroom window. The vanity table, suspended between the closets, has six shallow drawers for cosmetics and toilet articles, and a tip-up mirror. The closet doors are covered with cork tiles that match the floor, making the room seem more spacious.

A Picture Gallery of Modern Built-Ins

THE LONG AND SHORT of the knickknacks you like to display in a cabinet will fit this unique shelf layout. Staggered L-shaped shelves have space between them for short objects, yet the end of each "L" provides double height for that occasional tall bottle or oversize cookbook.

WITH PLENTY OF KNEE ROOM because it has no legs, this vanity table bridges the space between a bookcase headboard and a nearby corner. A mirror fastened with clips to the underside of the hinged lid completes the vanity. With the lid down, it becomes a writing desk.

PENINSULA COOKING UNIT separates the kitchen from the dining area and permits cooking from either side. Simply by extending the heavy-duty wiring, the range can be moved from a wall counter to its new location. The cabinet beneath provides extra utensil storage.



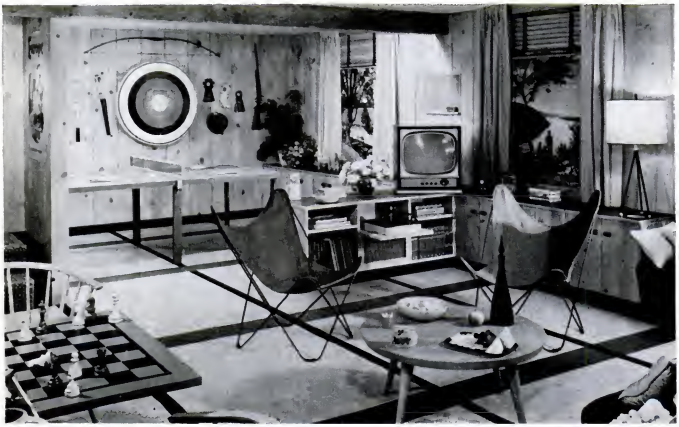
TWO-FACED DOOR in a rumpus room stores game equipment in its recessed, perforated - hardboard front. Swung outward like a secret panel in a mystery thriller, it exposes a closet for hanging guest's clothes. A roller beneath the free end takes the weight off the hinges. Sliding doors in the lower half make a cabinet for storing games in boxes.

WITH BUILT-IN BUNKS, a "single" room is fine for two. This pair is made of the same vertical plank material used on the walls. Spacious drawers in the base of each bed are partitioned for shirts, socks, underclothes and pajamas, eliminating a chest of drawers in the room. A flush-door table provides plenty of elbow room for the occupants.

A Picture Gallery of Modern Built-Ins

TRIPLE-DECK PULL-OUT makes linens more accessible than they'd be on fixed shelves. The cabinet door was unhinged, three shelves fastened to it and casters added to make a linen cart that can be rolled conveniently to the beds or to the laundry room.

CLOSET SPACE IS MULTIPLIED by dividing. The partitioned frame shown here was built in a workshop and installed as a unit in this family-room closet. The idea can be adapted to any closet in the house simply by varying its size to suit the need.



PLYWOOD PLANKS are doubly useful for finishing game-room walls and for constructing matching built-ins or room dividers. The planks come in four- or eight-foot lengths that are quickly installed with metal clips nailed to studs. Knotty-pine planks are shown here. END

Now! New wood finishing beauty for your wood paneling and furniture

New Weldwood Satinlac Lightener and new, improved Weldwood Satinlac give you easier, more lustrous natural wood finishes than ever before possible.

To retain the true native wood color, use new Weldwood Satinlac Lightener as a first coat on unfinished wood.

- makes "invisible" protection possible, prevents the darkening or "wetting" look that usually occurs when conventional finishes are applied to virgin wood.
- preserves the color of freshly cut and sanded wood, and at the same time prepares the surface for subsequent luster-giving coats of Weldwood Satinlac.

For special effects, use Weldwood Firzite.

- **WHITE** for blond or pickled effects with a clear "woodsy" finish. Also as prime coat under paint—prevents checking, grain raise.
- **CLEAR** as a pre-sealer to assure even absorption of stain, prevent wild grain in softwood growth. Also, a perfect stain when tinted with colors-in-oil.

To get glowing, soft-sheen woodbeauty, use new, improved Weldwood Satinlac.

- brings out, preserves wood's natural beauty without the "built up" look of ordinary finishes; resists alcohol, water staining.
- resists fading or yellowing with age: new Satinlac contains an exclusive Ultra-violet ray screen that inhibits the effect of light on the wood's color.
- goes farther, works easier, has less odor; new Satinlac's improved formula contains twice as much solids as formerly; greatly superior solvents give better flow.

CHOOSE THE FINISH YOU WANT from this helpful display with 27 real wood samples, now at leading paint, hardware, and lumber dealers'. Shows you many of the beautiful wood finish effects you can obtain with new Weldwood Wood Finishes.

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SATINLAC® • SATINLAC LIGHTENER® • FIRZITE®

And other products for home and industry

Send for new Weldwood Paneling Family Room Booklet. Shows how you can build fun-giving, space-giving new value into your home.

There's a Weldwood Adhesive for every purpose

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Box 61, New York 46, N. Y. PS-9-58

Please send me:

☐ Information on Weldwood Wood Finishes.

☐ New full-color booklet, "Family Rooms In Beautiful Weldwood—100 Interesting Ideas For The Room Your Family Lives In." I enclose 10¢.

NAME.....

STREET.....

CITY.....ZONE.....STATE.....

You Can Buy Built-Ins —or Build Them

SUPPOSE you don't have the spare time, know-how or urge to build a built-in from scratch. You'd gladly pay a reasonable sum for cabinetwork but want to avoid a costly custom job.

Then follow the example of architects and building contractors. Buy factory-made built-in units and adapt them to your own particular needs. Today there's a big assortment of these products. If you still can't find just what you want, consider the possibility of framing in free-standing furniture. Either way, you'll benefit from mass-production prices.

For your kitchen. No room in the modern home has been given more attention by the manufacturers of built-in components. The units they offer range from prefab plastic and wood drawers to fully finished and handsomely mated cabinets with integral sinks, electric dishwashers, stoves, ovens and counter-top lighting.

The flossiest of the cabinet lines are available in both enamel-surfaced steel and fine-veneered plywood. They fit together as many ways as dominoes to make full use of any basic room layout. If you wish, you can install them yourself, with the help of clearly illustrated instructions.

For a more modest kitchen installation, there are unpainted built-in units. These are usually plywood-faced, and come in both partly and fully assembled form.

Counter tops are an integral part of some unpainted base cabinets. For others you must either cut and surface a plywood top yourself or order a custom-made unit from the cabinet manufacturer. Special fill-in strips, shaped to the contour of the cabinet faces, make it easy to pad out a group of sectionals for snug fits with abutting walls.

For dining and living rooms. If there's an open way between your dining and living rooms, you may want to close a part of it off with a free-standing divider. Either unpainted or finished modular furniture is ideal for this job. Stack cabinet, bookcase, desk and whatnot units together any way you like—the result is an eye-filling built-in.

Prefab corner cabinets come in so wide a range of designs today that even in the most expensive homes you'll rarely find a custom-built unit. Here you can buy either free-standing types or open-backed models designed specifically for permanent installations.

For bedrooms and baths. Two ready-made wardrobe closets and a flush door may be all you need to convert an otherwise conventional wall and window area into a striking vanity bay. Or you can make better use of that low-headroom space beneath the eaves by stacking chests of graduated depths as close to the ceiling as possible and closing off the gap at the top with paneling or wallboard.

Medicine chest too small? There are any number of built-in units designed to solve your problem. Some of the more elaborate ones have sliding mirror-surfaced doors, built-in illumination and conveniently placed electric outlets. They come in two basic types—models that project from the wall, and true built-ins designed to fit between the studs.

For basements and utility rooms. Here, where finished appearance may not be important, give a thought to prefab open framing. In this line you can buy the skeletonwork for chests of drawers and either cover them or not. With knock-down plywood drawers, one of these units will probably cost you less than the retail price of the raw materials, if you allow for a normal amount of wastage. It's the biggest economy deal in the whole field of factory-made built-ins.

WHETHER YOU'RE REPAIRING or REPLACING

IT WILL PAY YOU TO USE *Southern*

CORROSION-RESISTANT FASTENERS

It's Fall fix-up season — time to get busy on those home repairs, rust stains or other deteriorating places inside or outside your house.

The wisest way to fix 'em "once and for all" is with corrosion-resistant fasteners by Southern. Replace or repair with Southern's corrosion-resistant fasteners, and the shaky or unsightly places on doors, moldings, thresholds, door-stops, storm windows, facings, etc. will be eliminated.

Depending on the degree to which you need resistance to corrosion, use Southern plated steel, brass, Everdur silicon bronze, aluminum or stainless. Ask your dealer for his recommendations on your application.

Solve your next corrosion-resistant problem before it happens. Plan now to use Southern corrosion-resistant fasteners.

Be sure to specify Southern fasteners by name at your lumber and building supply dealer or hardware store. Available in Phillips or slotted in all popular head styles and in all standard plated finishes.

REMEMBER:

Only a Screw Holds Like a Screw

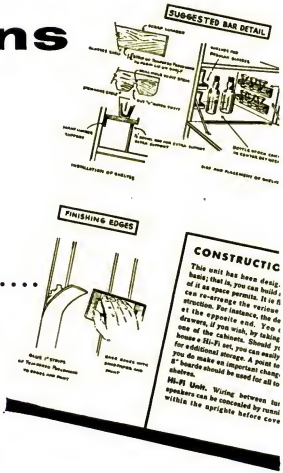
Wood Screws • Tapping Screws • Machine Screws and Nuts • Wood Drive Screws • Stove Bolts • Dowel Screws • Carriage Bolts • Hanger Bolts

Southern Screws are Sold Through Leading Wholesale Distributors

Warehouses: New York • Chicago Dallas • Los Angeles

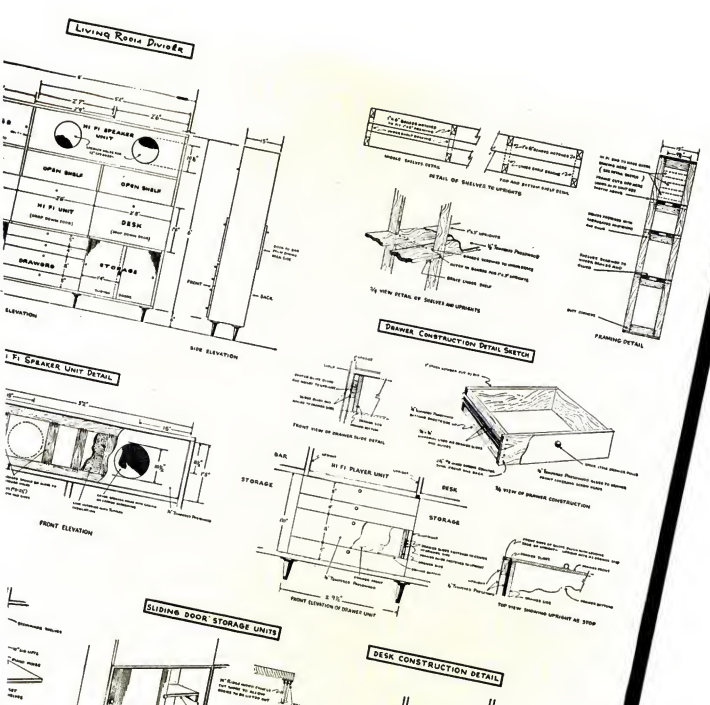
Southern SCREW COMPANY STATESVILLE • NORTH CAROLINA

Working Plans for Built-Ins Are Free



WHEN it comes to modernizing your home with built-ins, there's no reason to settle for less than the best in functional design. Thanks to a number of commercial organizations—including your local lumber dealer—plans from the drawing boards of top designers and interior decorators are yours for the asking (or for very little more than the asking).

You can just about name what you want—built-ins for children, laundry built-ins, swing-out sewing centers, hi-fi music corners, space-saving wall cabinets, under-the-eaves storage closets, tuck-away sports lockers, cooking centers,



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Pressboard. Lead-in may be placed between 1" x 6" boards and down the upright to a socket near the base of the unit. Bond a channel alongside of the brace under each shelf to admit wiring.

You will note that the sound chamber has been insulated and given extra braces to provide a vibration-free area. Tweeters, or other smaller than the outside radius of the speakers, so you will have a fastening surface for the speakers. Cabinet wire cloth or fabric should be installed over the openings before speakers are fastened in place.

The door to the player unit is constructed in the same manner as the door in the desk. The interior of this section will be built according to the requirements of your particular Hi-Fi equipment.

Liquor Cabinet. The size and arrangements of shelves in this section can be adapted to your specific needs. The two doors are made like those of the desk, except that the outer surface of the door to the dining area side will be made of Masonite Pre-Board.

A Word about Conditioning. Before applying Masonite Pressboard products, follow the specific instructions for conditioning the type of Pressboard you are using. These are given in the application sheets, available from your building materials dealer.

Finishing. In general, finish the surface of Pressboard as you would ordinary wood. A good primer or sealer coat is most important. Then follow with one or two coats of good grade paint or enamel. Pressboard may also be varnished, lacquered or stained. Use brush or roller. Follow manufacturer's directions closely. Several types of Pressboard are available with Primerite. Only the finish coat is necessary.

Use ¾" wire heads to fasten Pressboard to all wood framing members. All nail heads should be set slightly below the surface of the panel. Shelves should be screwed to frame with 2½" wood screws and glued. Screws should be countersunk slightly before surfaces of the board.

Metal: For best results, bevel all exposed edges of Pressboard. Use plane, hand or power sander. Exposed edges of frame may be covered with 1" strips of Tempered Pressboard and painted, or edges may be covered with metal and painted. Shown at left.

TYPICAL PLAN that you can get free is shown here. It has details you'd need to build a combination room divider and music center for your home.

Working Plans for Built-Ins Are Free.....

serving centers, outdoor storage walls, built-in magazine racks, or a foldaway office for your wife—name it, you can have it. Some lumber dealers can give you a list of places where a letter or an ante of 15 cents or a quarter will bring you detailed how-to-do-it construction plans for just about any kind of built-in.

What you will get will be no mere sheet of suggestions with the irksome details left up to you. In most cases, you will get carefully drawn-up plans complete with step-by-step instructions that can be translated easily into cut lumber for assembly. Many of the plans—particularly those indicating plywood construction—will also include cutting diagrams (so you get the maximum out of a panel) and suggestions for finishing.

To help home owners visualize what a

Where You Can Get Plans for Built-Ins

Five major sources of plans for built-ins:

Douglas Fir Plywood Assn.
Tacoma Bldg.
1119 A Street
Tacoma 2, Wash.

Masonite Corp.
111 W. Washington St.
Chicago 2

Small Homes Council
University of Illinois
Urbana, Ill.

United States Gypsum Co.
300 West Adams St.
Chicago 6

United States Plywood Corp.
55 West 44 St.
N Y C 36

Other sources of plans include the following:

California Redwood Assn.
Financial Center Bldg.
San Francisco

The Celotex Corp.
120 So. LaSalle St.
Chicago 3

Dept. of Housing & Design
Cornell University
Ithaca, N. Y.

Forest Products Laboratories
Madison, Wis.

Georgia-Pacific Corp.
Portland, Ore.

Johns-Manville Sales Corp.
22 East 40 St.
N Y C 16

Mahogany Association, Inc.
666 North Lake Shore Drive
Chicago 11

Forest & Wildlife Dept.
University of Massachusetts
Amherst, Mass.

Michigan State University
East Lansing, Mich.

National Gypsum Co.
420 Lexington Ave.
N Y C 17

National Hardwood Lumber Assn.
59 East Van Buren St.
Chicago 5

National Lumber Mfrs. Assn.
176 West Adams
Chicago

National Woodwork Mfrs. Assn.
332 South Michigan Avenue
Chicago 4

Ponderosa Pine Woodwork
111 West Washington St.
Chicago 11

Red Cedar Shingle Bureau
5510 White Bldg.
Seattle 1

Simpson Redwood Co.
Arcata, Cal.

Southern Pine Assn.
National Bank of Commerce Bldg.
New Orleans 4

Dept. of Forest Utilization
State University College of Forestry
Syracuse University
Syracuse, N. Y.

West Coast Lumbermen's Assn.
1410 S.W. Morrison St.
Portland 5, Ore.

Western Pine Assn.
Yeon Bldg.
Portland 4, Ore.

White Pine Bureau
200 Bay St.
Toronto, Ontario, Can.

Wood Conversion Co.
First National Bank Bldg.
St. Paul 1, Minn.

New Valuable Guide for Men

"HOW TO MAKE WOOD A BEAUTIFUL PART OF YOUR HOME"

Wood grains, patterns, textures you can choose! Striking effects you can create! Practical new designs, plans and ideas! Hundreds of the things you want to know about natural wood finishing, decorating and building . . . yours for just 50c in one 56-page booklet . . . by Monsanto, makers of REZ—world's most colorfully complete line of natural wood finishes!

Monsanto has prepared a wonderfully helpful booklet for you — a complete how-to-do-it guide for decorating with wood and REZ natural grain sealer-finishes. Now you can choose from hundreds of wood grains and patterns, textures, colors and finishes **and achieve exactly the results you want every time.**

See the woods you want for your home . . . Woods—light, sun-warm and refreshing. Woods — of rich dark tones. Woods—with dramatic whorls and patterns. Woods—with subdued grain tracings of quiet charm. Compare the most popular practical woods and plywoods. You actually see how their nature-grown beauty is enriched with a colorful variety of REZ grain-revealing finishes.

New booklet shows how natural wood becomes part of your color scheme with Color-Toned REZ. Outside, you can capture the charm and "feel" of forest, desert, mountain, seacoast or country landscape on your siding, carport, fence, trim or patio . . . inside, you can follow the same color scheme on paneling, cabinets, doors, valances, woodwork — coordinate wood color with carpeting, draperies and upholstery.

Saves you money . . . helps you select your favorite wood in the least expensive grade for your use—buy lumber, paneling, unfinished furniture and finish it easily in a few hours— enjoy all the luxury of good wood at low cost.

Easily adaptable ideas — illustrated ways to make home improvements you've always wanted — get more living space with built-ins, add on a family patio-porch, convert your basement into an activity room or rathskellar. 35 new designs. Guide plans. Easy to build.

New ideas in wall paneling . . . money-saving suggestions. How you can install and finish paneling yourself—save 25% to 60% of total cost you pay for wood.

Built-in, multipurpose cabinets you can custom-build to save space, make better use of existing storage area and open up more floor space for active use.

Different fence designs for beauty, privacy, sun screen, wind protection.

A treasure-chest of valuable additions to your home. Ways to make old rooms into new rooms with storage walls, book shelves, room dividers, closet stretchers.

Professional wood finishing made easy! Amazingly simple, sure ways to create a satiny, hand-rubbed look without rubbing or waxing . . . any color effect on any wood and enrich the natural beauty of the grain . . . a "bleached" or blond look without chemically bleaching. Tricks by master craftsmen you can use to bring out the distinctive best of redwood, pine, gum, fir, cedar, oak, birch and others.

REZ solves every wood-finishing problem for you: no cracking or peeling, controls grain raise, ends mottled and uneven colors, protects against spotting from alcohol and water, defies stains and abuse. Brush it on as easily as water . . . REZ penetrates, seals, finishes — lasts for years — will not peel or blister — guards woods from sun and weather outside — gives lasting beauty inside.

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Monsanto Chemical Company
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St. Louis 1, Missouri

Send me the color-filled, 56-page guide, "How to make wood a beautiful part of your home." I enclose 50c.

Name_____

Address_____

City_____ Zone____ State_____

Working Plans for Built-Ins Are Free

particular project will look like when completed, many lumber dealers even have 3-D viewers stocked with color slides of particular projects. Along the same line, most large lumberyards also have a fair selection of the most popular plans to save customers the trouble of writing to the companies that put them out.

In any case, if you've a built-in in your future you'll do well to consult your lumber dealer or, if he can't suggest some good sources for free or next-to-free plans, drop a few letters to some of the companies on the accompanying list.

And while you're thinking of built-ins you might also consider "built-outs" for outdoor use next spring and summer. Plans are available for all sorts of projects slanted toward outdoor living—from simple patios to garden "rooms."

Expertly prepared plans help you with these typical built-ins

CUSTOM-TAILORED READING CORNER: The plans for this magazine and book rack are designed to be changed. You build it to fit *your* corner simply by juggling the basic dimensions.

SWIVELING TV can be seen from either of the two rooms separated by this functional room divider. The divider also houses a hi-fi setup and provides you with storage for records.

SERVING CENTER can be built as an island or, as above, as a peninsula unit jutting out from a wall or existing cabinets. Revolving shelves make hard-to-reach "dead" space usable.

ENTRY CLOSET, separating entrance hall from living room, is convenient for checking hats and coats as friends arrive. Hats are stored safely on individual shelves on the side. END

New, easy way to modernize your kitchen electrically

Electrostrip PATENTED 4-footer

Takes only minutes to install!
Just plug it in to electrify!

Designed especially for use where space is limited, the Electrostrip "4-footer" provides electrical outlets anywhere along its length. It mounts readily on any surface without breaking into plaster. Predrilled holes every 8 inches simplify installation.

You have no wiring problems—just insert the handy, polarized connector to electrify the "4-footer". Then simply twist in receptacle plugs where you want them for lamps, appliances.

The "4-footer" comes complete with 3 twist-in receptacles. It's polarized for maximum safety, is listed by Underwriters' Laboratories and carries the *Good Housekeeping* Seal. Purchase Electrostrip now at your hardware, building supply, variety or department store. Or, to order direct from BullDog, add 50¢ to the purchase price to cover handling and postage.

The "4-footer" costs only $2.95. For larger installations in your kitchen, bedroom or living room, the 15-footer is available at $9.95.

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Made by BullDog Electric Products Company, Division of I-T-E Circuit Breaker Company, Dept. S, Box 177, Detroit 32, Mich. In Canada: Toronto 15, Ont.

Oak Grain, Perforated – Walnut Vertiboard – Oak Random or Walnut Blok

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See your dealer now and plan your WOOD-GRAIN PLATEBOARD "room beautiful" as a family project for some weekend soon.

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Abitibi

ABITIBI CORPORATION GENERAL SALES OFFICES
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Manufacturing Plant, Alpena, Michigan

Return this coupon or write for free literature on how and where to use WOOD-GRAIN PLATEBOARD and other Abitibi PLATEBOARD products. Forward to Abitibi Corporation, Dept. PS-9, Penobscot Bldg., Detroit 26, Michigan.

name _____

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city _____ zone _____

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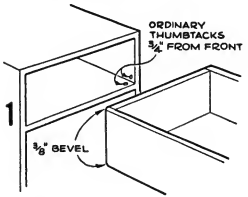
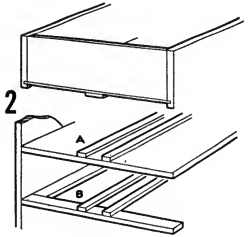
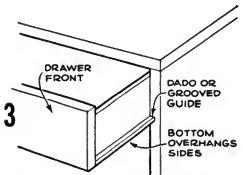
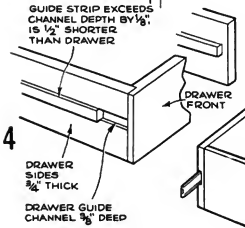
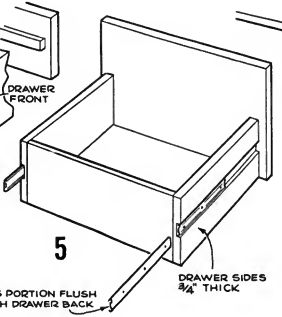
6 Ways to Install Drawers

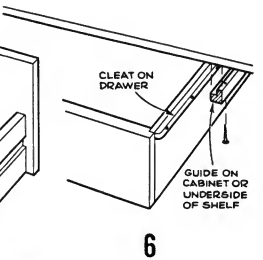












1 SLIDE THE DRAWER ON THUMBTACKS. In a simple installation, where the drawer opening is boxed in with plywood, the smooth heads of thumbtacks provide easy operation. The drawer face can fit inside the opening, flush with the cabinet's front surface, or it can overlap the opening so its edges are flush with top and sides.

2 USE A CENTER GUIDE STRIP, especially on wider drawers, to maintain alignment and prevent jamming. Screw the strip to the drawer bottom and fasten two rails to the drawer shelf (A) or cabinet frame (B), spaced so that the strip slides easily between them. If desired, the rails can be screwed to the drawer bottom and the center strip fastened to the shelf or frame.

3 USE THE DRAWER BOTTOM AS A RUNNER by making it overhang the sides by ½". The overhanging edges slide in dadoes or in grooved guides inside the cabinet. Drawers must be constructed especially for this installation: Instead of grooving the sides to receive the bottom, you groove the bottom and set the sides into it.

4 HANG THE DRAWER ON SIDE GUIDES. Screw wood guide strips to cabinet sides and cut matching grooves in drawer sides. Drawers can be hung one above the other in a box-type cabinet without framing openings. Wax strips and grooves to make drawers glide easily.

5 INSTALL METAL DRAWER SLIDES where you must pull the drawer all the way out, as in a record-player cabinet. The simple channel slide shown is inexpensive and easy to mount. There are deluxe types available that float effortlessly on ball bearings.

6 FOR A QUICK INSTALLATION under a table or bench top, use L-shaped cleats to support a drawer. Screw wood strips along the top of the drawer sides to slide in the cleats. If the depth of the table permits, extend the strips beyond the rear of the drawer.

NEW KIND OF PUSH-PULL POWER SAW WORKS LIKE A "POWERIZED" HANDSAW—

EQUALS HANDSAW + BUCKSAW + CHAIN SAW!

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All-Around Use. Precision cuts—follows a chalkline, leaves smooth mill-edge. Use it for EVERY kind of outdoor sawing job—farms, estates, camps.

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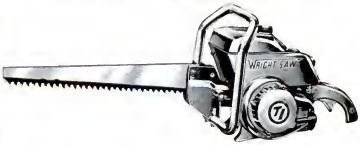
Reciprocating blade moves back-and-forth like a "powerized" handsaw—166 power-strokes a second

NO DANGEROUS CHAIN



World's Safest Power Saw—Only the Blade Moves. Safety trigger shuts engine off instantly, *automatically*, if saw is accidentally dropped. No fire hazard.

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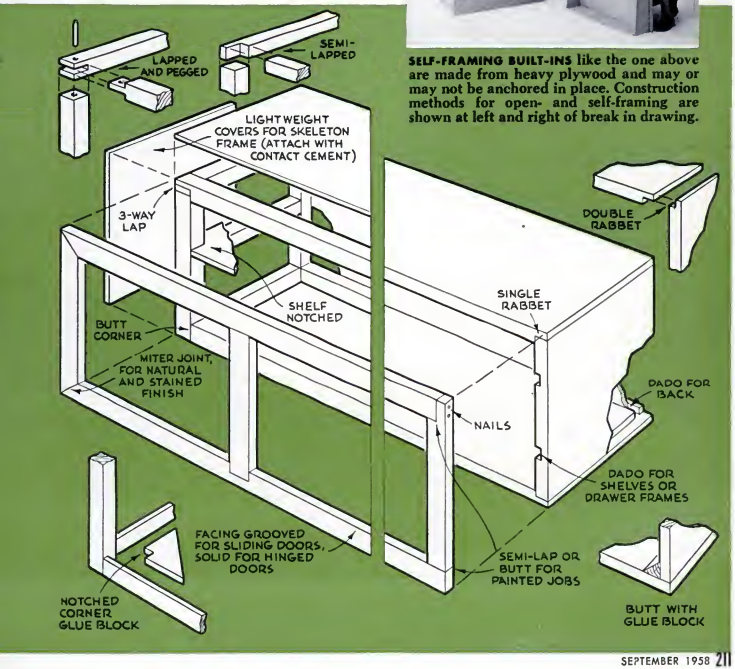
YOU CAN USE EXISTING WALLS AND FLOORS as integral parts of a built-in that has open framing like this. The new skeleton work is covered with relatively light and inexpensive materials.

How to Start Building Built-Ins

YOU know where you're going to put that built-in, what its purpose is, and how you want it to look. The next important question is: How should you frame that built-in *in?*

Like any other piece of furniture, it will need some sort of basic structure to act as a carrier for such features as doors, drawers and shelves. But this will be no ordinary frame. It must be tailored to a

SELF-FRAMING BUILT-INS like the one above are made from heavy plywood and may or may not be anchored in place. Construction methods for open- and self-framing are shown at left and right of break in drawing.



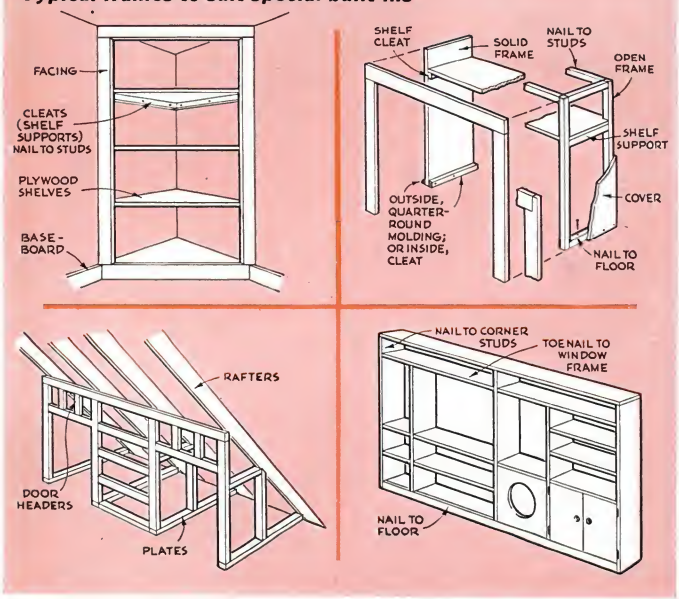
particular spot. Very likely it will be anchored permanently there. In that case the existing house walls, ceiling and floor may become integral parts of the new unit.

This raises problems. What type of framing is best? How do you fasten it in place? Suppose there's a lot of trick fitting. Maybe the walls are not quite plumb. Or part of the ceiling is angled below the eaves, and the floor has a slight slope. How do you make your built-in conform to these irregularities? Equally important, how can you still keep the framing in the proper position for doors that hang nicely, drawers and panels that slide smoothly, shelves that are dead level?

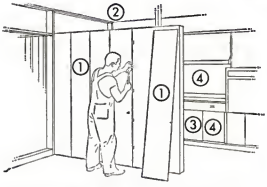
Open or self framing? First, let's consider the two basic types of built-in construction. One way, you tie a skeleton of open framing to the house structure and cover it with light surfacing materials. Actually, you are adding to the framework of your home. The other way, you build a unit of heavy, self-framing plywood sheets, shove it in place and, if necessary, anchor it there. Both methods have advantages.

Let's say that the unit is to fit in an alcove or recess where the present walls and ceiling can be used as the sides, back and top. Here, open framing will save you both money and time. Even if you don't want the old walls to show, you can hide them with attractive covering materials at a fraction of the cost of heavy, self-framing plywood. You'll also bypass much of the careful cabinet work that must go into a self-framing built-in. Because the skeleton is hidden, you can resort to simple butt or rabbet joints instead of miters, and eliminate a lot of gluing. There is no need to countersink

Typical frames to suit special built-ins



Modernize a room in a weekend with soilproof Marlite paneling!



Soilproof Marlite areas: 1. silver walnut Planks. 2. polar white Blocks. 3. pastel blue Hi-Glass panels. 4. dusty pink Hi-Glass panels. Interior designed by Ving Smith.

In a matter of hours you can turn a dingy room into a bright, modern interior with Marlite paneling. Marlite's exclusive tongue and groove joint cuts hours off installation time; assures beautiful results. Planks (16" x 8') and Blocks (16" square) go up without muss or fuss over new walls or old. And Marlite's soilproof plastic finish is washable. It resists dirt, smudges, stains . . . cleans with a damp cloth. This weekend, see your lumber dealer for Marlite in distinctive wood finishes, marble patterns, beautiful "Companion Colors." Ask him for your free decorating ideas book or mail coupon below.

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WALL and CEILING PANELING

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FREE! *Please send free 16-page, full-color decorating book (over 40 illustrations) packed with dozens of ideas to help you build and remodel better for less.*

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ANOTHER QUALITY PRODUCT OF MASONITE® RESEARCH

Use a level, not a square, in framing a built-in

FLOORS THAT SLOPE and walls that are out of plumb transmit their irregularities to open framing when you use a square. Only a level, as above, insures true horizontals and verticals.

OPEN FRAMING WILL BE COVERED, so you can use shim strips to make the structure level. You don't want slanting shelves, drawers that wedge, or doors that will refuse to stay closed.

DOUBLE-LAPPED CORNER JOINT is strong, yet can be fastened together with only two nails.

or cover nailheads. They won't be seen.

On the other hand, the self-framing built-in is usually your best bet for units that have more than two faces exposed. Here it becomes the lighter and easier form of construction. It also lets you do all of the work—except preliminary measuring and possibly the final assembling—in a shop. This can save a lot of steps and sawdust tracking through the house.

There's a possibility, too, that you may want to move your built-in to a new location later. With a self-framing unit you can. That's particularly important if you rent an apartment or house. Remember: A built-in that is attached more or less permanently to the property may legally be considered a part of it. In that case you may not be able to take it with you when you leave.

Again, there are times when a combination of open- and self-framing makes sense. Take a corner unit—a linen locker, for example. Here it may pay you to use the walls that make up the corner as one side and the back. For the other solid wall a plywood panel, cleated or dadoed on the inside to take one end of the shelves, will spare you a lot of carpentry and material.

Anchoring a built-in. A great many so-called built-ins are actually free-standing pieces of furniture. Room dividers and work islands are good examples. Another is the unattached floor-to-ceiling cabinet that fits flush against a wall. As a rule you can figure that if such a unit is at least 2′ wide and no more than 7′ high, there's no real need to pin it to its surroundings.

How about the shallower, self-framing unit, or the open-framed built-in that needs floor, wall and possibly ceiling support?

If the floor and/or walls are of masonry there are any number of fittings, including anchor plugs and bolts, expanding screws and gun-driven fasteners, that will give you all the gripping power you need for any cabinet load.

When you're dealing with a wood floor, nail directly to it. Walls covered with plaster or composition board are something else again. Here you must find load-bearing studs or joists. Hammer taps or a magnetic nail detector may locate them, but old-timers generally recommend a 1″

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*Minute Magic**

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changes operations in one minute

RADIAL SWING SAW
Saws at any angle

TILT ARBOR SAW
Outmodes every table saw

DADO SAW
Layout marks visible

SHAPER
50% more shapes

DISC SANDER
100% more angle work

HORIZONTAL DRILL
Bores at any angle

ROUTER
Ideal for variety work

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These tips make it easier to construct a built-in

FOR A SNUG BUTTING FIT against an irregular wall, hold a pencil compass as shown and draw it along wall surface to get cut line. Be sure the opposite edge of the stock is vertical.

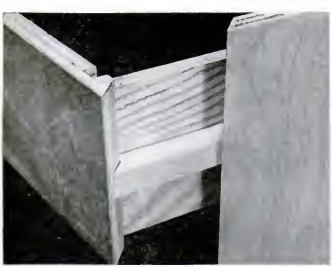
ALIGNING BACK-TO-BACK DADOES is easy with a miter-gauge extension through which a "tall" dado is cut first. Make one dado in the stock, flip the board, align slots, and cut again.

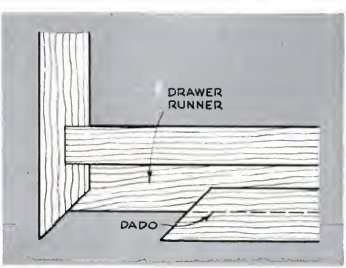
finishing nail. First they scribe a line across the surface where one of the horizontal members will be spiked. Then they drive the nail where they think some stud or joist should be (multiples of 16″ or 18″ from a room corner, a window, or a door casement may work). If they miss, they try and try again. No matter how many bad guesses are made there's no harm done—all of the holes will be covered by the new supporting member.

Snug fitting and leveling go together. Even a free-standing built-in can present an awkward problem if the floor beneath it isn't level. Drawers may bind, doors may swing outward when you want them closed. Unsightly gaps will show if you place the unit against a wall or corner. Under these conditions you can do one of two things. Either resaw the parts that bear on the floor and vertical surfaces or, if you think you may move the unit later, shim it up and hide the gaps with strips of specially tailored and easily removed molding.

In the case of a self-framed built-in designed for permanent installation, you may still find it easiest to square it up and depend upon shims and molding for final fitting and leveling. You can also use shims with open framing (the surfacing material will hide them). Under all circumstances, use a level—not a square or tape—to check built-in verticals and horizontals. If you don't, floor and wall irregularities are bound to carry over to the new construction.

Readying house areas for framing may require some savvy to get around a tough





WANT CONCEALED DRAWER EDGES in a built-in? You can have them with the simple combination of miter cuts and dadoes shown above. Runners placed halfway up the drawer sides act like glue blocks to further stiffen the corners. To add to their modern appearance, the tops or bottoms of the drawer faces can be extended so that they hide the built-in's cross runners.

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FOR WATERPROOF GLUING

Completely waterproof two-component resorcin resin glue forms a bond stronger than the wood itself. Resists continuous outdoor exposure, cold and boiling water, moist and dry heat, mold and fungus, solvents, acids and alkalis. Unbeatable for boats, outdoor furniture, sports equipment. Comes in ¼ pint and pint cans.

FOR NO CLAMP GLUING

Regular or nonflammable cements that bond on contact. Strong, water-resistant and heat-resistant. Best you can use for plastic laminates, plywood wall panels, leather, linoleum, synthetic rubber, thin gauge metal and all dissimilar materials. Can sizes in pints and quarts.

FOR GENERAL WOOD GLUING

This powdered casein glue makes strong, water-resistant joints. Works fine on hard or soft woods and many other materials. Mixes easily in cold water and can be used anywhere, even in cold outdoor temperatures. Ideal for laminating beams . . . gluing tables and counter tops, sashes and doors, molding and fixtures. 1 and 5 pound can sizes.

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A modern, ready-to-use polyvinyl resin glue for general interior use. Perfect for gluing dowels, paneling, inlays, marquetry, cloth, paper and all porous materials. Fast setting, dries clear. Available in refillable plastic squeeze bottles, tubes and jars in a wide variety of sizes.

FOR STAINPROOF WOOD GLUING

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Borden Glues are available at hardware, variety, paint and lumber supply stores everywhere. For a free chart which shows the right glue to use for every job, print your name and address on a post card and mail to: Elmer's Glue Chart, The Borden Company, 350 Madison Avenue, New York 17, N. Y.

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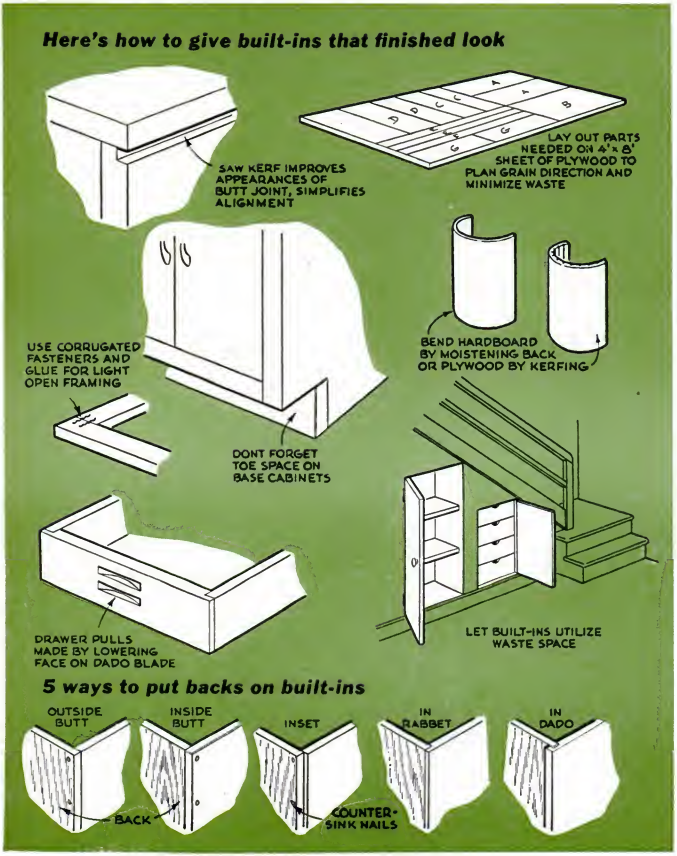
installing problem. Suppose an existing wall has a baseboard or wainscot cap. Nine times out of 10 it's easier to rip it out and, where necessary, re-apply a shortened section, or sections, than to try to fit new framing around it. Don't do this, however, if there's a chance of your moving the built-in later.

Possibly, too, you need a new electric outlet in the wall or floor for built-in illumination, electric-stove elements, or hi-fi equipment. Always have this work done, or do it yourself, before you start boxing in the area.

Finally, accept the fact that framing a new unit isn't the most exciting part of the job. But it *is* the most important. For no amount of fine finishing will hide the functional weakness of poor basic assembly and installation work. END



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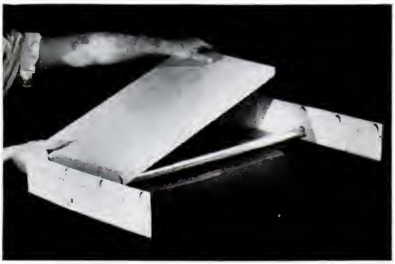
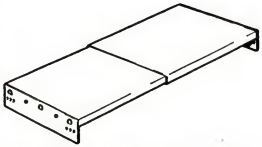
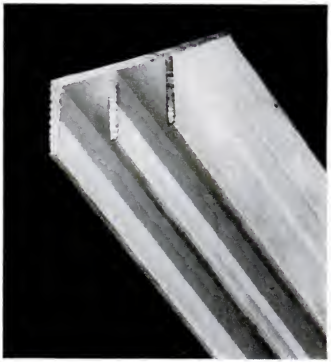
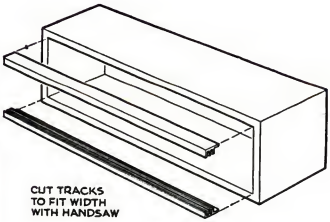


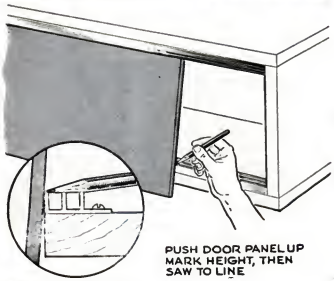


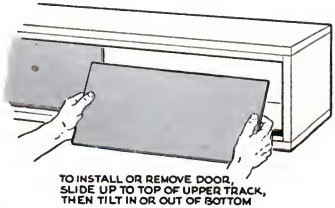
TELESCOPING METAL SHELVES are 12" or 14" deep, expand to fit any width from 2' to 7'. Just nail brackets in place, hook shelves between them. Shelves come plain for stacking, with closet pole, or with wall brackets. Makers include: H-C Sales Co., 3300 N.E. Adams St., Peoria, Ill.



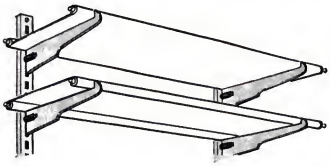


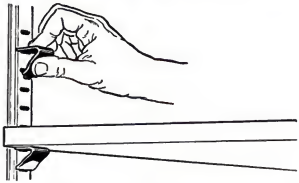
ALUMINUM TRACKS make it easy to add modern sliding doors to any built-in. Tracks are sawed to fit, then screwed to top and bottom through inner, hidden flange. Upper track is slightly deeper so door panels can be pushed up and marked for easy cutting against lower one. Doors then drop into lower track and can be removed any time. Tracks come 6' long, take doors either ⅛" or ¼" thick. Makers include: Reynolds Metals, Richmond, Va.; Macklanburg-Duncan, P. O. Box 1197, Oklahoma City, Okla.





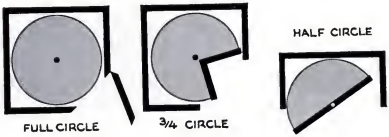
You Make Built-Ins



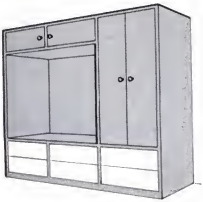


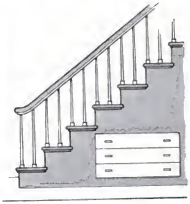
ADJUSTABLE SHELF SUPPORTS save making dadoed joints or cleats, let you change height quickly. Brackets above at left are for wall mounting. They take shelves 6″ to 14″ wide, also come with ready-made metal shelves. Clips (right) cost less, hold enclosed shelves. Makers include: Standard-Keil, 2581 Atlantic Ave., Brooklyn, N. Y.; Wilmac, 2632 N. Central Ave., Chicago; Macklanburg-Duncan, P. O. Box 1197, Oklahoma City, Okla.; Capitol Mfg. Co., 400-412 N. Leavitt St., Chicago; Shelfmaker Products, 1420 Harrison Ave., Kearny, N. J.

SPACE-SAVING REVOLVING SHELVES, one of the hardest items to make yourself, come ready-made in many full-circle, ¾-circle and half-circle styles to suit kitchen or other built-ins. You can buy center posts and bearings with either premade metal shelves or flanges for adding your own wood shelves. Makers include: Amerock Corp., 4000 Auburn St., Rockford, Ill.; Washington Steel Products, 1940 E. 11th St., Tacoma, Wash.

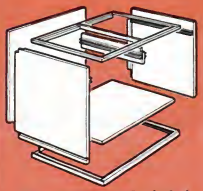


PREFAB DRAWER UNITS come with steel frames and guides, ready for quick mounting in cabinets or wall openings. Drawers are molded plastic with interchangeable wood or plastic-faced fronts. Frames are available in two- to six-drawer units. Widths are 18″, 27″, 30″ and 36″. Makers include: Reiss Mfg. Co., 111 Fourth Ave., NYC; Panelyte Div., 150 E. 42nd St., NYC; Boonton Molding Co. (plastic drawers only), Boonton, N. J.





ONE PAIR OF FRAMES is needed for each cabinet you build by the new Arcware system. When doors are added, only the frame edges are visible, as in kitchen at left. If desired, the aluminum frames can be fully concealed behind the plywood sides and doors of the cabinet.



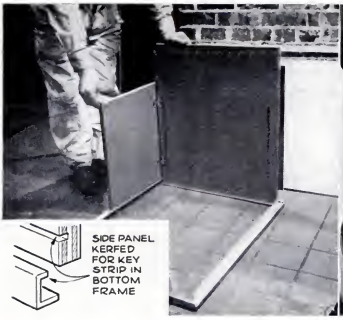
NO JOINTS: Exploded view shows secret of self-locking assembly. To basic three-sided box you add drawers, doors and a toeboard. Result is the cabinet shown below.

Now, a New Easy Way to Build Kitchen Cabinets

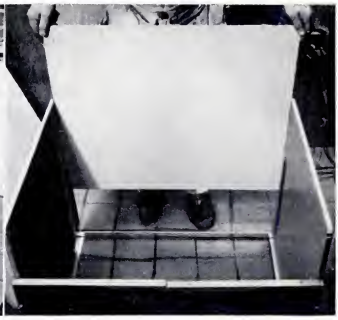
ALUMINUM frames lock plywood panels together to build cabinets without glue, screws or nails. The joinery—even the thinking—is done for you. An instruction sheet included with each set of frames tells you what kind of plywood to buy, and how to cut and groove it to fit the frames.

The secret of this new cabinet-building system is in the frames. Key strips in the aluminum fit into saw kerfs you cut in the side panels. The bottom panel, a rectangle with no grooves, locks the sides firmly on the key strips. The back panel slides into ¼″ rabbets cut in the sides, and the entire assembly is locked by installing the channeled top frame over the top edges of the three panels.

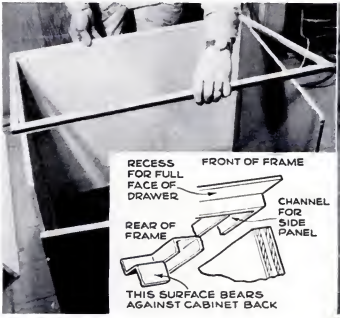
You can cut the grooves and rabbets with a power



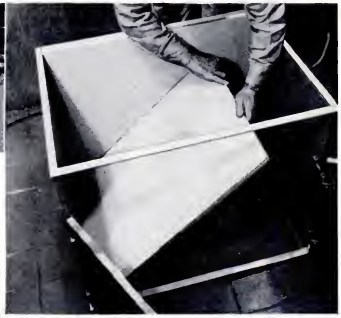
NO WORKING IN CRAMPED QUARTERS—doors, hangers and drawer guides can be attached before side panels are keyed into the frame. Check door clearance before applying the guides.



BACK PANEL is fitted into ¼" rabbets cut in the rear edges of the side panels. If accurately sized, the back panel will force the sides tightly against the metal key strips.



TOP FRAME IS THE KEYSTONE that locks the upper ends of the panels together. Metal framing for a 30"-wide standard base cabinet like this is about $13. Price of framing for an upper cabinet of the same width is approximately $10.



CUT BOTTOM OF CABINET to fit snugly between the sides and back panel. Pressed into position as shown, it locks the sides firmly in place within the aluminum frame. Cabinet can be disassembled any time by pushing the bottom up.

saw or router, or have them cut for you by the lumberyard where you buy the panel stock. Almost any combination of doors and drawers can be installed in the basic box. The open top is enclosed by a plywood panel or counter top, depending on the cabinet style.

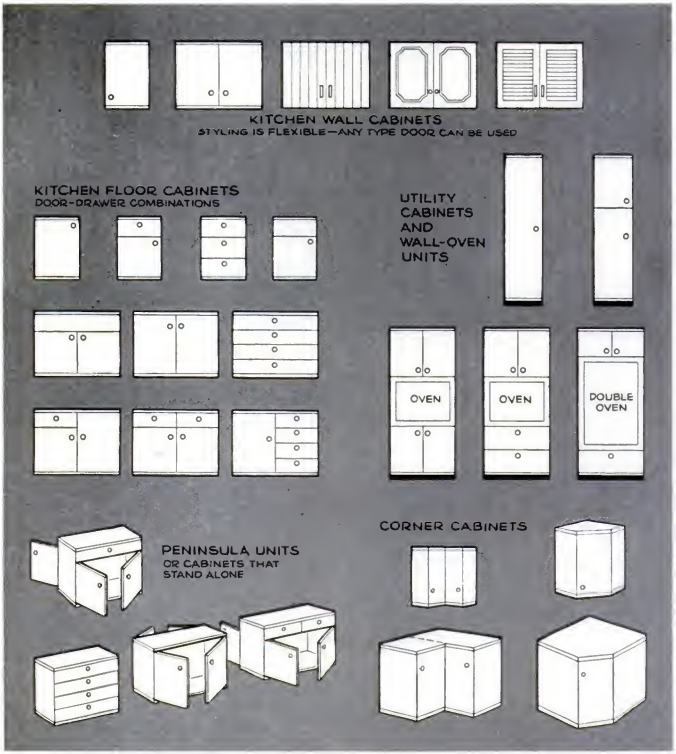
Simple construction is, of course, the big feature of these Arcware frames, made by the Architectural Hardware Co., 2132 Pacific Ave., Tacoma, Wash. But there are other advantages. After cutting the plywood, you can finish each panel before the final assembly, giving you the benefit of finishing everything horizontally—no paint drips or runs. Or you can use prefinished or plastic-surfaced panels and assemble them with a minimum of effort. And when you want to refinish the cabinets, you can knock them down as easily as you put them together, lay the panels out horizontally for maximum

Easy Way to Build Kitchen Cabinets

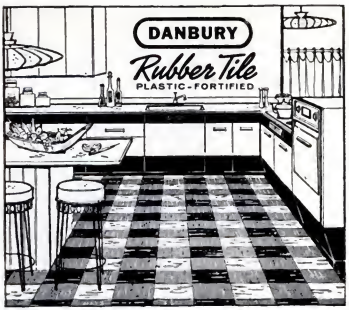
convenience, and work on each of them individually.

The frames are made in all standard sizes for fabricating floor and wall cabinets for kitchens. Special sizes are also available on order. You can buy frames to make utility storage units, as well as furniture, wardrobe and vanity designs.

Now made only in anodized aluminum, the frames will soon be available in brass, copper and gold finishes. They are distributed through lumber dealers, but if your dealer doesn't stock them, you can order direct from the manufacturer.



A FRAME FOR EVERY CABINET TYPE: All the cabinet styles above can be built around the aluminum frames, as well as some others (not shown), such as furniture and vanity types. Though the basic box is identical in all types, cabinet styling is set by the doors used. As shown along the top, they can satisfy any taste in decorating from Early American to contemporary. END



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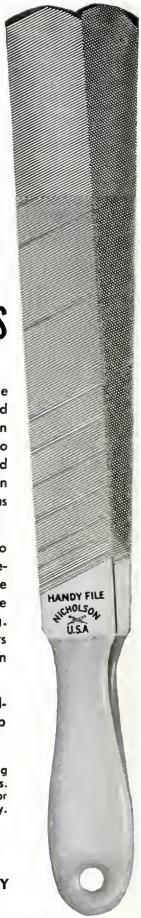

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The Handy file is really two files in one: one side is double-cut for fast stock removal. The other side is single-cut for fine smoothing and sharpening. The handy hang-up hole lets you store this file easily in your shop or tool shed.

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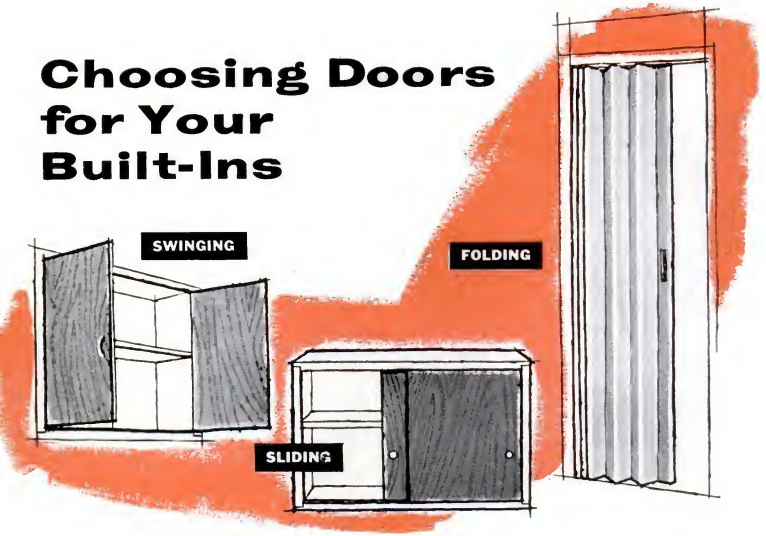
Choosing Doors for Your Built-Ins



THE right door makes a built-in easier to use and more attractive. These are the kinds of doors commonly used:

For cabinets

- Hinged—side, top or bottom.
- Sliding—bypassing panels.

For closets and other large openings

- Hinged—side.
- Sliding—bypassing or pocketed.
- Folding—accordion or bi-fold.

On cabinets, hinged doors give maximum accessibility if there is swinging room. But where two side-hinged doors would be needed to cover a wide opening, you might consider a single top- or bottom-hinged one instead. Such a door would open wide even when the cabinet is hemmed in closely at its sides by a wall or furniture. A bottom-hinged cabinet door with special drop-leaf supports can serve as a desk. A piano hinge is just right in this case.

Hinged doors, either flush or rabbeted, can be made from plain wood or a plywood panel. For a different effect you can join ordinary or tongued-and-grooved boards vertically and fasten them together with horizontal battens on the inside of the door. A thick yet inexpensive door can be built by sandwiching a wood frame between two sheets of regular or perforated hardboard—or one of each. Or you could cover just one side of the frame with hardboard.

On rabbeted doors, the rabbet depth is usually half the door's thickness. Best way to cut a rabbet is with a power saw, shaper or router, but there are also ways to get the same effect with hand tools.

One method is to make a wood frame the exact size of the cabinet opening. To the front of this, fasten a thin plywood or hardboard panel that overlaps the frame by the depth of the rabbet you want. You can leave the inside of the frame open or cover it with a second panel that fits flush.

Or build up layers of plywood or plywood and hardboard. One layer should overlap the cabinet opening by the rabbet depth desired. The other should be the same size as the cabinet opening, so it will fit in there when the door is closed.

Sliding doors need no space to swing in, so they're useful where a hinged door would bang adjoining furniture or offer

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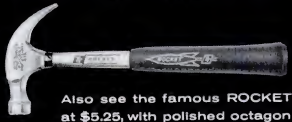

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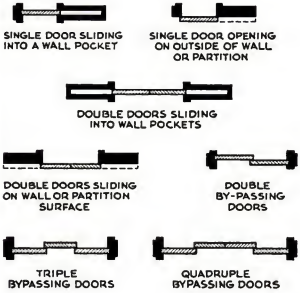
Choosing Doors for Your Built-Ins

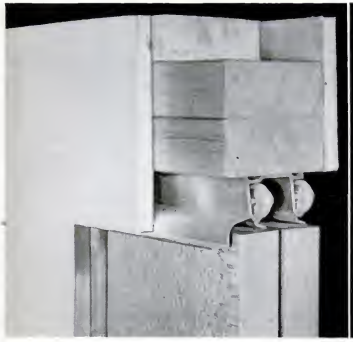
a head-bumping hazard. Disadvantage, of course, is that at least half the opening is always blocked. You can use many materials for sliding panels: plywood, hardboard, plate glass, plastic, metal, or heavy fabric or wire mesh stretched over a wood frame.

Rout a deeper groove at the top of the cabinet opening than at the bottom. That's so the door can be removed by lift-

Sliding doors need no swinging room, fit closets or cabinets



SEVEN WAYS TO USE SLIDING DOORS involve three basic systems: putting doors in pockets, letting them lap each other, or running them along an adjoining wall. Bypassing type (left) is the simplest to install.



OVERHEAD TRACKS for many big sliding doors are shaped to take plaster or dry-wall construction without difficult fitting or fancy trim. The track shown is made for plasterboard.

SMALL CABINET DOORS of light plywood or hardboard paneling slide in grooves at top and bottom of opening. Recessed finger pull, set in a blind hole, is the only hardware needed.

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Choosing Doors for Your Built-Ins

ing it up and pulling it outward at the bottom.

For heavy doors on a cabinet or a full-length closet opening, use overhead metal tracks with wheels and hangers.

In a large opening, a simple hinged door is the least expensive and easiest type to install. Hollow-core flush doors, one-third lighter, and less expensive than the solid kind, come in many veneers to match the rest of your built-in. Standard thickness is 1⅜″, usual height 6′8″, and width varies in 2″ steps from 1′4″ to 3′. Special sizes and virtually any wood finish are possible on special order.

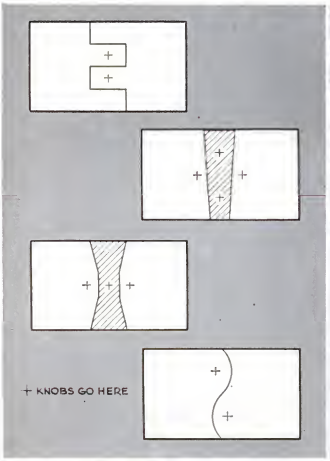
You can make up a batten door to exact size for less than the cost of most hollow-core doors. Use pine or veneered-plywood panels joined with horizontal wood strips.

Sliding doors on closets are most commonly a pair of bypassing panels. They're attached to wheeled hangers that roll in an overhead track. Installation is simple: You screw the track to the header over the opening, attach hangers to the panels and lift the panels into place. A floor guide keeps the doors from swaying in and out.

Doors that slide into pockets leave an entire opening clear. The opening can be narrower than with bypassing panels and covered with one door instead of two. You can build a pocket into the wall adjoining the built-in or on the face of it. Building the pocket into the wall takes more work (you may have to demolish the existing wall first). An on-the-wall pocket encroaches slightly on floor space.

Framing for a door pocket can be done with two-by-fours or with a kit made for the purpose. Most kits contain steel split studs and jambs plus a combination header and track.

How to make swinging doors look different



FOUR SAMPLE DESIGNS show what you can do. Top and bottom ones were cut from one panel the exact size of cabinet opening. The saw kerf prevents thin doors from binding; thick ones may need sanding along the inner meeting edges. Two middle doors close against fixed center uprights (shaded areas). A simple diagonal cut was used on doors in photo above.

Folding doors include the accordion and bi-fold types. You can buy accordion doors in standard widths from 2′ up to 14′. Standard height is 6′8″. A track comes with the door (it's usually aluminum or steel and can be sawed to fit, if necessary). Installation consists of screwing the track to the underside of the doorway header. You thread the door hangers on the track and fasten one side of the door to the jamb. A screwdriver is the only tool needed.

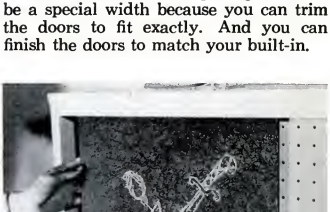
Least expensive of the accordion-fold doors is the plain fabric kind without a frame inside. For narrow, infrequently used openings, they work well. But on wider doorways where easy operation and small stack space (width when open) are important, use a steel pantograph frame covered with plastic-coated fabric. Or you can spend a bit more and get accordion-fold wood-veneer doors.

Wood folding doors come finished or unfinished. You can buy an unfinished one at a saving and apply stain and/or a top coat to match a built-in. Or you can paint it.

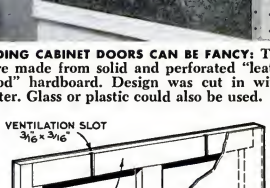
One of the most versatile types of folding doors is the bi-fold. With an inexpensive kit of hardware you can hinge together wood panels, louvered shutters, or wood frames covered with such material as fabric, wood strips, glass or plastic.

Bi-fold hardware can be used on any doors from ¾″ to 1⅜″ thick. Two doors will cover an opening up to 3′ wide; four doors will span 6′. The opening need not be a special width because you can trim the doors to fit exactly. And you can finish the doors to match your built-in.

VERSATILE BI-FOLD DOORS are made with a hardware kit and louvered shutters, screens of fabric or wood strips, regular or veneered plywood. You stain, varnish or paint them yourself.

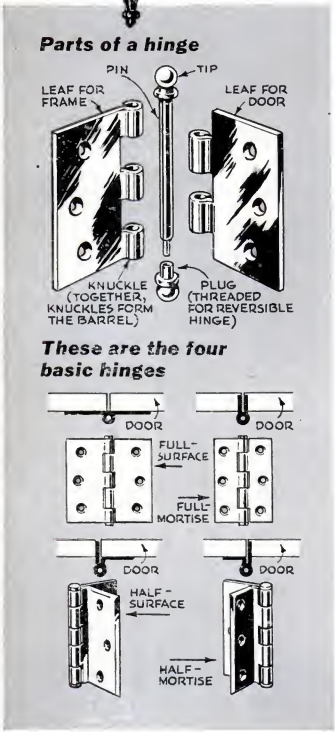


SLIDING CABINET DOORS CAN BE FANCY: These were made from solid and perforated "leatherwood" hardboard. Design was cut in with a router. Glass or plastic could also be used.



INEXPENSIVE FLUSH DOOR for large or small openings is a framework of one-by-twos covered with tempered-hardboard sheets ⅛″ or 3/16″ thick. Door can be used hinged or sliding. END

What You Should Know About Hinges



ONCE a pair of rawhide straps and eight spikes were all it took to hang a built-in door. Now it isn't that simple. The almost endless variety of cabinet hinges displayed in any hardware store proves it. There you'll see ingenious flip-flaps with their leaves folded or offset in a dozen different ways. Some have cigar-shaped joints that pull apart when you lift up on one half. Others resemble bell cranks. Still others are nothing more than two interlocked plugs.

All this variety is fine if you know what you're looking for. If you don't, you should. There's no real mystery about any cabinet hinge. Each is engineered for some particular job, and it does it either with or without a switch in one of four basic hinge designs. Learning about these designs and the reasons for the modifications shouldn't take you more than 10 minutes.

The four basic designs. All hinges have a movable joint connecting two leaves. One leaf is mounted on the cabinet structure, the other on the swinging member. It's *where* the leaves are fastened to a door (or lid) and its frame, and *how* it is installed, that determine the basic hinge type.

A hinge that has both leaves attached to the exposed surfaces of the frame and door is a *full-surface* hinge. One whose leaves are mortised into the facing edges of a door and frame is a *full-mortise* hinge. If one leaf is applied to the surface of a door and the other mortised into the frame edge, it's a *half-surface* hinge. And when it's the other way around—one leaf on the face of the frame and the other mortised into the edge of

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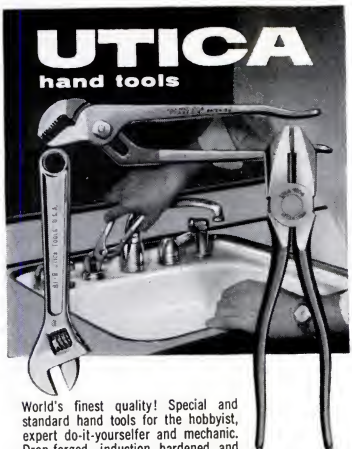

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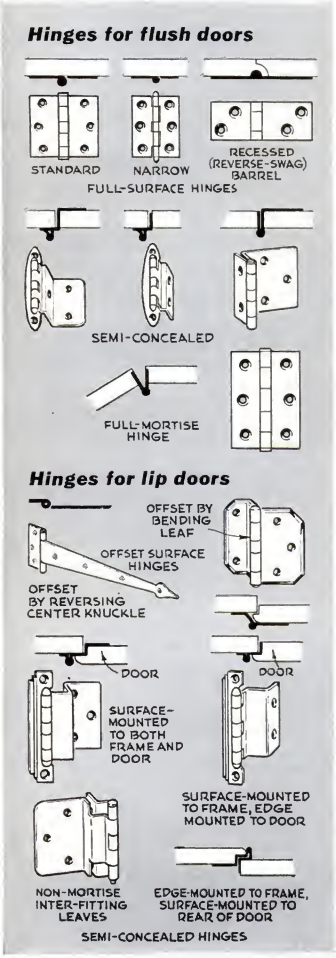
What You Should Know About Hinges



the door—you have a *half-mortise* hinge.

If the doors of a built-in are flush and there's enough surface area on the frame, you can use conventional full-surface hinges. (That's assuming, of course, that this type fits in with the cabinet's styling.) Or, if the doors and frames are thick enough to provide ample support, the other three basic designs are fine for less conspicuous hinging.

Why the modifications? While flush doors are a good choice for many traditional and functional built-ins, you may prefer either slab (overlay) doors, or doors with their edges rabbeted to provide shallow lips.

This is where the hinge modifications start. Suppose you want to hang a lipped door with full-surface ornamental hinges. You can, with a type called an *offset-surface* hinge. Here, the leaf that is mounted on the frame is given an outward bend just far enough away from the barrel to let the other leaf fit over a ⅜"-thick door lip. Remember that dimension when you cut the rabbets.

Again, you may go for a lipped door, but want a hinge installation in which only the leaf section attached to the frame shows. Or just the barrel, perhaps. By giving the hinge leaf that attaches to the door a compound bend—first inward, then back in line with the rear surface of the door—manufacturers produce a *semi-concealed* hinge. Or by using the same zigzag on the door leaf, and bending the other leaf backward and around the edge of the frame, they solve the problem of hiding both leaves.

Leaf-forming tricks like these are used to produce special hinges for many other purposes. They'll let you hang a slab door in such a way that only the barrel shows, or give you the effect of a full-mortise hinge when the door and frame are too thin for the real thing. One bent leaf combined with a straight one make the most popular form of chest hinge used today. It's sturdy out of all proportion to its size and hides both leaves.

Invisible hinges. Other modifications give you a real specialty job—invisible hinges. These are particularly well suited

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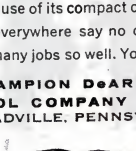

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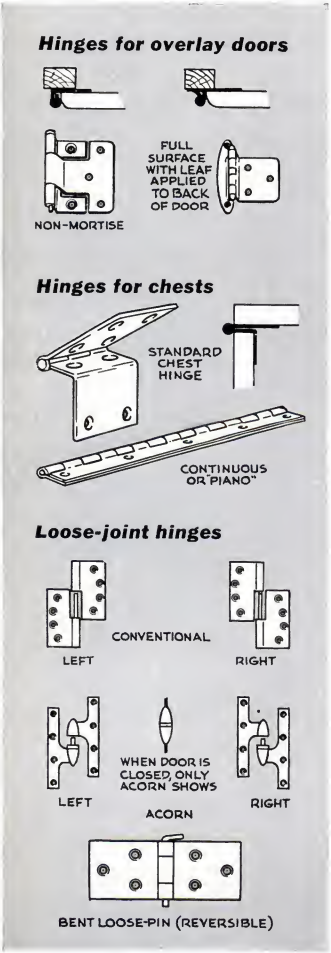
What You Should Know About Hinges



to contemporary built-ins, where the accent may be more on the surface texture of a cabinet than its fittings.

Some invisible hinges have rectangular or circular castings in place of conventional leaves. You mortise the rectangular kind into the facing edges of a door and its frame. For the cylindrical type, you bore two mating holes, tap the metal plugs into them, and use cross pins for anchors.

Another, but not quite as invisible, hinge, used extensively for overlay doors, has two horizontal wings, pinned together at their outer ends with a rivet. The other end of each wing is angled over 90 degrees to form a vertical leaf. The rivets and parts of the wings show at the top and bottom of the door, but because they're thin and in a horizontal plane, they're not conspicuous.

How barrels and pins differ. The joints of most hinges are formed by curling prongs on the mating edges of the leaves to form knuckles. When these knuckles are dovetailed they form a continuous barrel for a pin. In conventional hinges, one leaf has both of the end knuckles curled into it. This is the one you should always attach to the frame.

The pin that fits into such a hinge may be either removable or permanently riveted in place (a variation of the latter, or fast pin, has ornamental tips permanently attached to the two ends). The removable, or loose, pin has a tip on one end and a turned-down shank section at the other which fits in a hollow plug attached to the hinge's bottom knuckle.

The advantage of the *fast-pin* hinge is that it can usually be reversed—placed with either end up to hang any door, whether it swings to right or left. This is true for all but certain types of ornamental fast hinges, which must be bought in mirror-image pairs.

Most *loose-pin* hinges can't be reversed, because the pins work out if you turn them upside down. The exceptions are some large door-hanging types, which have threaded (not press-fitted) plugs. With these you can screw the plug into either of the end knuckles to provide a

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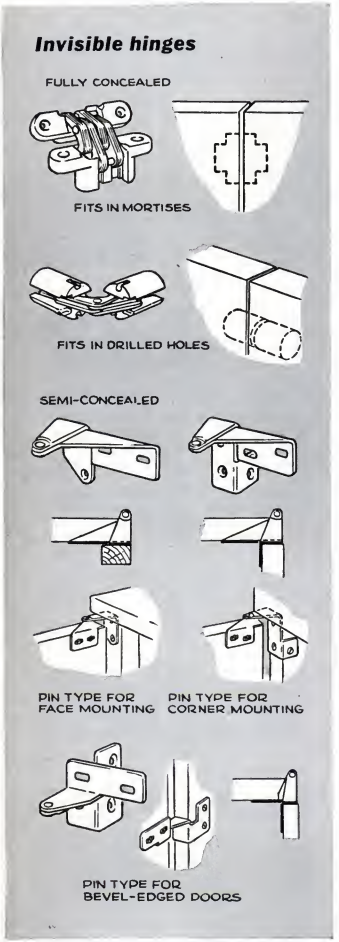
What You Should Know About Hinges



firm seat for a pin inserted from above.

Still a third kind of hinge uses only two knuckles—one on each leaf. A pin, press-fitted into the lower knuckle, projects into the upper, free-turning knuckle. Known as a *loose-joint* hinge, this type is the most convenient for detaching and rehanging a removable door. Due to the pin-and-barrel arrangement, however, it is not reversible. Here's a rule to remember when you must buy non-reversible hinges: If you want a cabinet door to swing to the right as you face it, ask for a left-hand hinge. If it's to swing to the left, ask for a right-hand hinge.

How to judge hinge quality. The barrel is your best cue to hinge quality. The edges of the knuckles should be accurately squared to provide maximum bearing areas. They should also be aligned to produce a barrel with a smooth, continuous surface. This indicates accurate reaming for the pin. Grasp the leaves and check for any sign of sloppy play between them. Also close the hinge to see if the leaves are accurately aligned. Holes to accommodate flatheaded screws should be countersunk for a flush fit.

Styling. Modern cabinet hardware lines are offered in such handsomely matched sets that they've come to be known in the trade as "jewelry." You'll find hinge, pull and catch sets for any kind of built-in—traditional or contemporary. You need no advice on the styling; that's a matter of personal preference. But you should give some thought to the finish. To tie in with contemporary furnishings, the ones most used today are black with gold tips, and copper with black tips. For Early American flavor, black or antique copper are generally best. Chromium platings are by far the most practical for kitchen and bathroom hardware, but here practicality must go out the window if the room is treated in period style. Properly lacquered brass- or copper-plated steel hardware is good for all-around installations. But for strictly utilitarian purposes, unplated steel may be perfectly satisfactory, provided your built-in isn't subjected to high humidity that will cause rust. END

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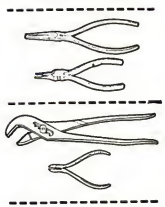

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Makers of famous NoDrip Tape
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How You Can Use Built-Ins

[*Continued from page 190*]

area that the householder is less interested in displaying than in having ready for action.

3. Keeping things where you need 'em. Built-ins can take much of the clutter out of a home. But they will do that for you only if you tailor them shrewdly to your family's way of living.

For instance, the popular built-in home-entertainment center—with hi-fi rig, TV or tape recorder—suits many families but could make less sense for others. A good built-in must be personally yours—*not* a proof that anything your neighbor builds-in you can build-in better.

More important at your house might be a totally different built-in—perhaps a bed with shelves and cupboards in the headboard. (Not only will everything from snacks to books be within comfortable reach, but you'll find you can eliminate bulky chests of drawers and night tables—an example of the point made earlier, that a built-in anywhere in the house saves the cost of equivalent furniture.)

4. Face-lifting your rooms. Some built-ins are used and not seen. But this is the home owner's choice. While a built-in can hide behind the wallpaper, you might choose to display one deliberately.

Open shelves, for example, can relieve the monotony of a wall; the grain of the wood selected for a cabinet becomes part of a room's total impression; the stain or enamel can set a warm tone for a dining area, a cool one for a bedroom.

5. Improving floor plans. One dramatic use of built-ins is to divide rooms—and this in turn brings up the dramatic potentialities of something radically new in built-ins, the storage wall.

The storage wall promises to take the old question, "Are there enough closets?" out of the language of home planning.

Imagine a home where nothing gets "stored away for the season" to collect attic dust or basement mildew; where nothing gets lost, either, because everything is literally within arm's reach, day by day, season after season.

That is the home plentifully endowed with storage walls. Whether you buy or build, the principle is usually the same: box-shaped units (in immense variety of woods and finishes) that can be stacked up one on the other, either flush against

a wall or to divide a room in any way you like.

A waist-high divider might let the chef in the kitchen stay with the conversation at the dining table; somewhere else, a divider upward to ceiling-high could make two rooms of one.

The beauty of storage units is that they can divide rooms and multiply space. Survey your family's paraphernalia. You'll notice that many items would fit into containers only a foot deep—and nearly all of them into units not more than *two* feet deep. The promise here, then, is more handy, accessible cubic yards of storage than you could dream of getting from closets and trunks.

Any built-in, from cellar to attic, pull-out desk to room divider, will fit your home best if you keep a few cautions in mind:

- Don't build-in just to build-in; find a project to fit an interest of your family.
- Measure with the end use in mind. Just plain space is often waste space. For example, a collection of equally spaced shelves plus a couple of deep drawers could hold all the things that now clutter your kitchen—but if your built-in isn't proportioned to the items you want to store, it may become a new center of confusion, missing the point it was created for.
- Keep designs simple. A built-in is an aid to modern living, not a gewgaw.
- Ask: Will my built-in belong, or will I be turning the room upside-down to accommodate it?
- If your built-in requires wiring, plan in advance where you will get the current.
- Decide ahead of time if your project is to be physically attached to the house, or kept portable.

This last caution, by the way, foreshadows a future dilemma. To plan your built-in, you've looked at familiar rooms with fresh eyes. You've tailored something to the needs of the people who use these rooms. In a uniquely satisfying way, you've been a home engineer. Now suppose you decide to sell and move: Will you leave your built-in to increase your home's value in the eyes of potential buyers? Or will you let sentiment prevail over financial considerations, and proudly cart your prized built-in off to the new address? END

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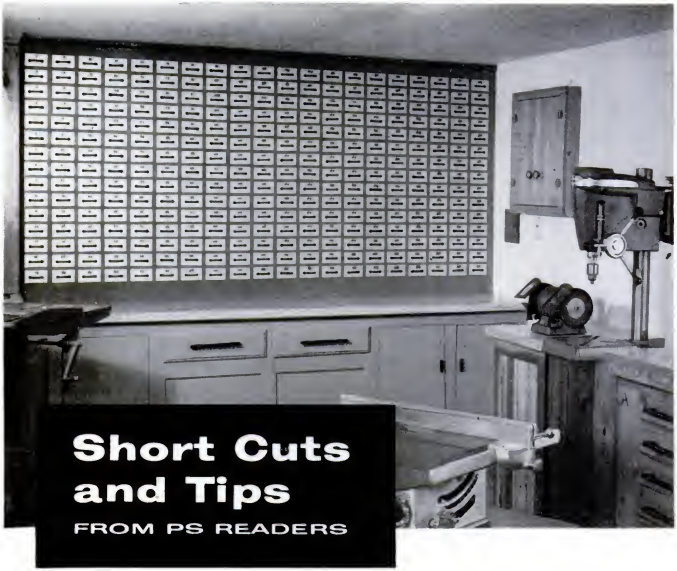

Short Cuts and Tips

FROM PS READERS

Indexed File for Small Parts

AFTER many years of fumbling and fussing all over the shop when I needed a particular small part, I took the bull by the horns and made a 300-drawer file cabinet. To go with it, I mounted hinged leaves in a case on the wall and attached to them a sample of each part together with the number of its drawer.

I made the drawers a uniform 2″ by 4″ by 7″ in size, using stiff cardboard glued and stapled. Drawer fronts are 1/8″ hardboard, and the handles are strap loops screwed through into a fitted piece of plywood.—*Larry W. Anderson, Seattle.*

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Short Cuts and Tips

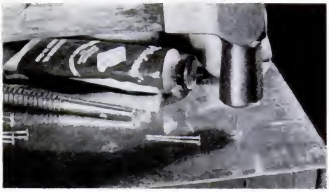
Shoe Bag Keeps Shop Rags Sorted

A SHOE bag tacked on your shop wall in the basement, or hung up, makes a handy container for rags. They can be "filed" in the pockets according to size, material and use.—*Mrs. N. B. Laskow, Los Angeles.*

Holder for Snelled Fishhooks

THE leaders on snelled hooks don't get tangled in my tackle box since I made this holder from a 4"-by-11" scrap of ¼" wood.

The curved part of each hook slides over one end, which has been grooved to hold them snugly. The leader is then held fairly taut at the other end by a length of slotted garden hose. — *Bob Sistare, Westerly, R. I.*



Sealing Nails in Metal

YOU can seal a nail in sheet metal that will be exposed to water by driving it through a drop of household cement—or spread the cement on the nail shank after it has been started. Drive the final ⅛" with a nail set to keep cement off the hammer.—*Walter E. Burton, Akron, Ohio.*

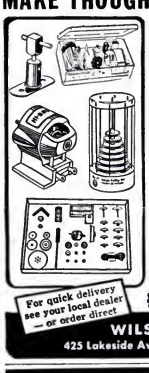
Magnet Blocks Pad C Clamps

I PAD C clamps with hardwood blocks held to the jaws by button magnets.

The magnets I use are slightly larger than ¾" diameter, just right for a snug fit in ¾" blind holes bored in the blocks.

I force them into place in a bench vise and, when the blocks wear, re-use them by simply splitting the blocks off with a chisel.—*H. J. Gerber, Stillwater, Okla.*

ELECTRIC MOTORS — POWER KITS MAKE THOUGHT-PROVOKING GIFTS



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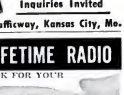

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THE FINEST YOU CAN BUY — KV FIXTURES

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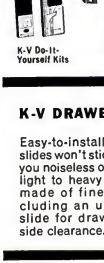

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Easy-to-install K-V drawer slides won't stick or jam, give you noiseless operation. Five light to heavy duty models made of finest steel, including an under-drawer slide for drawers with no side clearance.

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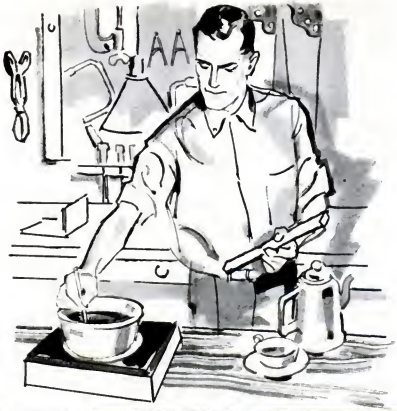
Short Cuts and Tips

Add a Hot Plate to Your Shop Tools

YOU'LL find a single-burner hot plate very useful in a home shop—for warming glue, melting tar, preheating metal to be soldered, warming a can of paint (set in a container of water) and keeping the pot of coffee hot.—*John Mihalick, E. Liverpool, Ohio.*



Easy Way to Fill Water Can

THE handle on a sprinkling can always gets tangled up with the water faucet when you're trying to fill up. I cut off the female coupling from an old garden hose, leaving a few inches of the hose attached. With this on the faucet I can set the can on the ground and fill it without getting wet. A short length of ¾″ i.d. aluminum tube shoved into the end of the hose improves control of the stream, but the hose works without it.—*Arthur Tanner Jr., Poughkeepsie, N. Y.*

I Polish Metal with a Drill

I POLISH the inside of cylindrical metal devices like sleeve bearings, brake cylinders and the like with steel wool wound around a drill bit. Let the point of the bit pull the steel wool onto itself as you turn the drill chuck by hand in its usual working direction. Match the drill-bit size to the work. Use enough wool to make a thick layer and prevent marring by the bit. Now turn the drill or lathe on and you can make quick work of any polishing job.—*Ken Hadenfeldt, Storm Lake, Ia.*

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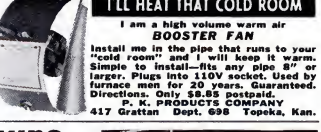

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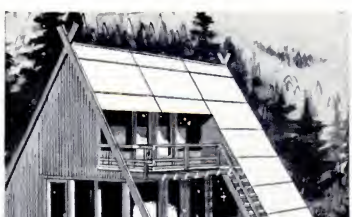

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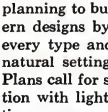

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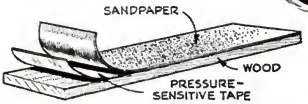
Short Cuts and Tips

Cleanest Way to Use Solder Paste

I APPLY soldering paste with the brush that comes in a nail-polish bottle. It does a neat spreading job and keeps fingers clean.

After cleaning the empty bottle with polish remover, I fill it with the paste. Warming the bottle helps the paste settle to the bottom—*Alfred Thompson, Rochester, N. Y.*



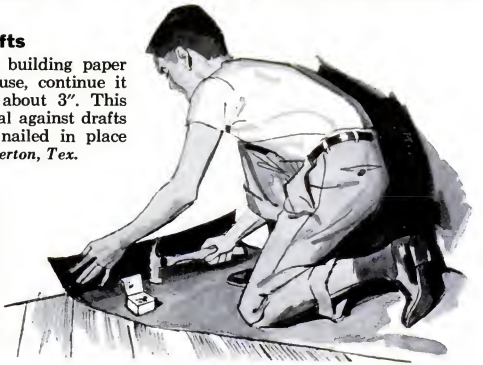
Sanding Stick for Tight Spots

A SANDING stick fits into places you can't otherwise reach. I pressed a strip of pressure-sensitive tape, sticky both sides, onto a narrow piece of wood. To the tape I then stuck a sandpaper strip. —*Hector Ettari, White Plains, N. Y.*

▶▶▶I FOUND a way to recondition the old brushes on floor waxers and polishers. Soak them in kerosene for five minutes. Then rub two brushes together with a circular motion while still in the kerosene —this removes old wax. Wash out the kerosene with household detergent in warm water. Rinse in fresh warm water, shake out vigorously, and put a wide rubber band around the bristles' sides. Brushes return to their original shape while drying.—*Carl Beddig, Oakland, Cal.*

Seal Out Floor Drafts

WHEN you lay down building paper over a subfloor in a house, continue it up adjoining walls for about 3″. This flap will make a good seal against drafts when the baseboard is nailed in place later.—*N. M. Pittman, Overton, Tex.*



▶▶▶TO KEEP the radio antenna on my automobile from rusting, I rub it occasionally with a piece of waxed paper. This transfers a thin protective coating of wax to the metal.—*John Comstock, Wellsboro, Pa.*

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H MODEL

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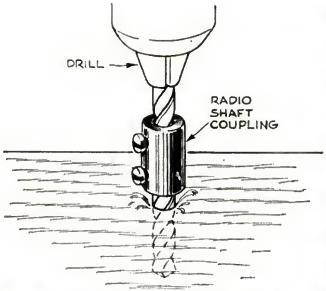
MY HUSBAND hangs his wet boots from the underside of a closet shelf, upside down. He bores a small hole in the front side of each heel and slides this onto a sturdy curtain-rod hook that has been screwed into the shelf. —*Mrs. Lloyd L. Aurand, Paducah, Ky.*

▶▶▶HERE'S how I drill a hole in porcelain without chipping it. I paste paper or stick gummed tape over the spot to be drilled, overlapping it ½″ on all sides. Then I mark the hole position with a pencil and start drilling. The drill won't "walk" on paper, so center-punching is unnecessary.—*W. Tegner, Oakland, Cal.*

▶▶▶NEED to tighten a loose-fitting screw that's always working loose? Setscrews on doorknobs or appliance controls are examples. I spread hot solder on the topmost threads. Clean bottom threads guide the screw back in; the soft solder becomes threaded and makes a good tight fit.—*Harry Stanley, West Chester, Pa.*



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I USE a ready-made depth gauge for drilling blind holes—it came from an old radio. The gauge is a coupling that connected two tuning-condenser shafts; they come with ¼″ and ⅜″ inside diameter. For smaller drills I add a bushing of shim stock, or steel or brass shafting.—*W. B. Eagan, Floyds Knobs, Ind.*

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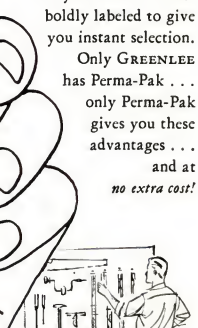

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How You Can Learn to Read Faster

[Continued from page 87]

idea; the rest is amplification or qualification. The key idea is usually stated in the first sentence. For instance, in the preceding paragraph, the key idea is: "Before reading, preview." Once you have the key, you have a guide for picking essentials from the remainder of the paragraph. Instead of plodding straight through the paragraph and tipping your hat respectfully to each word, says Professor Paul Leedy, "your mind should play over it like a dragonfly above a stream."

3) Learn to recognize "signpost" words, which tell you that you can speed over what's ahead, or that you'd better slow down temporarily. The words *and, also, furthermore,* and *moreover,* for example, usually tip you off that what's coming is amplification. Speed up. The words *but, still, however, nevertheless* are normally signs that a new thought or an unexpected twist is coming. Slow down.

4) Learn to recognize words and phrases that are pure noise and contribute nothing to the meaning. When you compose a telegram, for instance, you usually leave out articles — *the, a, an* — because they cost much more than they're worth. Forms of the verb "to be" are usually more bark than bite, too, and in fact are often left right out of spoken conversation. "You going home?" is just as meaningful as "Are you going home?"

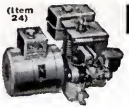
Sometimes whole groups of words are "noise." For example, you can jump over these phrases when you see them coming:

We are pleased to announce that
In connection with this matter
Hoping to be of further service to you in the future
We shall naturally look forward to
We beg to remain

According to most authorities, reading improvement happens fast; it isn't a question of long, tedious practice and elusive results. Within a month, if you work at it, there should be a noticeable jump in your speed and comprehension. Inside of three months, you can double your speed.

What you'll have, when you finish, will be a valuable tool for your career. You'll have a decided edge over slower-reading competitors for the big jobs ahead. END

This is the first article in a series on the Science of Personal Success. The next will appear in the October issue.



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Atomic Blasting for Peacetime Feats

[Continued from page 106]

shell under the mountain's weight. The cavity's roof fell in, and the collapse progressed 400 feet upward, enlarging the cavity and filling it with 200,000 tons of broken rock. Around the spherical cavity, the blast had pulverized another 500,000 tons of rock.

Probers found rock temperatures up to 194 degrees F., three months after the detonation. This was despite the fact that much of the bomb's heat went to vaporize water in the porous rock, a glassy volcanic kind called tuff. In dry rock, the temperatures would surely run much higher.

What had happened to the bomb's radioactivity was a mystery, until core drills recovered blackish fragments of the broken glass bubble. That was where it was. The molten lava had caught the bomb's fallout. And now the fallout was safely locked up, unable even to contaminate ground water, within the pieces of insoluble glass that lay in a 10-foot-thick bed at the bottom of the cavity.

Deep-underground A-blasts, these findings showed, could have impressive peaceful applications. Here are some as described to this writer by Dr. Johnson, Project Plowshare's co-director:

A new way of mining is promised by the enormous amount of rock that an underground A-bomb crushes—700,000 tons, by even the "baby" Rainier bomb. With a few nuclear blasts, a whole ore body can be pulverized. Then a leaching solution can be piped right down to it, allowed to percolate through the crushed ore to dissolve out the valuable minerals, and pumped back to the surface—much as sulphur is being mined with hot water today.

The heat, too, of buried A-bombs can yield mineral treasure. In one U. S. region alone (the Green River area of Colorado, Utah and Wyoming), lies enough oil to supply the world's needs for centuries—more than 500 billions of barrels. Locked up in shale, too expensive to mine and treat, it goes unclaimed. Plowshare men are fascinated with the prospect of recovering it with underground A-blasts, whose heat would distill the volatile hydrocarbons in recoverable form. And there has been speculation whether A-bombs' heat, by stimulating oil flow through rock,

might revive petroleum fields now considered exhausted.

Running a sizable power station with A-bombs looks possible. As Dr. Johnson sees it, deep explosions first would form two Rainier-like cavities. Assuming that A-bombs could be fired repeatedly in the same cavities, they would serve as steam boilers in this fashion:

In one cavity, a bomb heats the rock. Water is piped down, and turns to steam on contact with the hot rock. Led to the surface, the steam drives a turbo-generator—as natural volcanic steam does today, in Tuscany and elsewhere. But a difference is that the bomb's heat lasts a limited time. So, while one "boiler" is yielding steam, the other cavity is reheated by a new blast. By firing bombs alternately in the two cavities, and drawing steam from them in turn, the plant runs continuously.

Alternatively, nitrogen or carbon dioxide gas could serve as the heat-transfer medium, instead of steam. The heated gas would drive a gas turbine.

The power plant's size? Dr. Johnson envisions one generating 500,000 to 1,000,000 kilowatts, ranking with some of today's largest. For "fuel" it would consume 15 to 30 megatons of bombs yearly, which could be variously programed. For instance, one 150-kiloton bomb could be fired every two to four days, or half as often in each "boiler." The bomb size would set the depth of the blast—about 2,400 feet for a 150-kiloton bomb, shallower for smaller ones.

Right over the blast would be no place for the power station—it would be jumping like the Nevada mesa top. But the earthquake-shock intensity falls off so fast with distance from "ground zero," the Rainier study shows, that the generating plant could be reasonably near.

Among other proposed uses for deep-underground atomic bombs, one has special novelty—it would deliberately breach the earth's surface. That would be the mechanics of creating "aquifers" or underground water-storage reservoirs in dry stream beds. Set off beneath the watercourse, an A-bomb would cause a cave-in, forming an opening in the bed. Through it, the water of spring and storm runoffs would funnel downward for storage. Then, gradually seeping outward through

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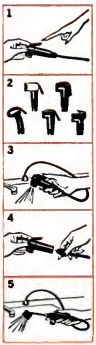

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Atomic Blasting for Peacetime Feats

subsurface rock seams, it would irrigate parched areas whose meager rainfall now is wasted by runoff and evaporation. The Rainier test proved this plan's key point—the excavation could breach the surface without releasing fallout, which the underground lava bubble traps and seals *before* the cave-in occurs.

Those are the bold outlines of bold plans. Are they to be taken seriously? The answer comes from eight or more U. S. companies whose names read like a Who's Who of American industry. On their own initiative, they have come forward with proposals for conducting Plowshare-project experiments jointly with the AEC (which alone can supply the bombs). Westinghouse is interested in power from A-bombs; Dow Chemical, in oil shale, and aquifers too; Richfield and others would like to test petroleum-field applications. At this moment the AEC was understood to be trying to work out ways it could cooperate. And further tests of its own, including a 1,200-foot-deep A-blast of 10 kilotons in New Mexico next summer, were planned.

Naturally some Plowshare projects must come about by gradual steps, perhaps with quite modest beginnings. As the first step toward an A-bomb power station, say, you might expect to hear of a bomb trial to test a simple "loop" or circuit to carry out the heat—a fundamental element of a complete design. Thus final plans will be built upon tried and proven concepts.

One thing that could block these plans gives Plowshare people uneasy moments. They worry lest world political developments should persuade the U. S. to suspend nuclear-bomb testing completely. This would bring Project Plowshare to a dead stop. Any test ban should exempt non-military trials, they say, so that this great peaceful program can go on.

Test-limitation talk has indirectly been responsible for a still more radical peaceful-bomb idea. During a recent Columbia University study of the possibility of detecting violations of a ban, it fell to a young physicist, Dr. Jay Orear, to determine whether a nuclear-bomb explosion could be concealed by setting it off within a sealed metal container. His answer was yes. By his figures, the explosion of a one-kiloton A-bomb could be

completely bottled up inside a steel sphere 500 feet in diameter and six inches thick, set above the ground on shock-absorbing pillars to minimize earth vibrations. No telltale fallout would escape.

From this way of taming nuclear explosions, above ground, grew an idea that Dr. Orear presented last spring to a startled audience at an American Physical Society meeting in Washington. He pictured the theoretical possibility of constructing a gigantic chamber in a natural canyon, to harness larger bombs for power. Choosing a site in a canyon 400 feet wide, he would line the natural walls with steel plate to 500-foot height, and box off the canyon with two dams 700 feet apart. A domed steel roof, deeply covered with earth, would complete a vessel able to withstand an interior pressure of 500 pounds to the square inch.

***NEXT MONTH:** Are nuclear-powered rockets and missiles nearer than most of us have realized? Pioneer atomic engines are already being groomed for proving-ground tests. For an inside glimpse of hush-hush U. S. programs, read October PS.*

Twice every hour he would explode a 10-kiloton nuclear bomb within this chamber. The explosion would vaporize a pool of water at its bottom, and the resulting superheated steam would transmit heat to pipes just below the roof, in which feed-water would be turned to steam to run the turbines of a nearby power plant. Between explosions the chamber's pool would refill, as the vapor cooled and condensed in torrential "rain." A thick mist would remain. Its droplets would consume bomb energy in revaporizing, and this would have a blast-absorbing effect increasing the safety factor. This installation, the Columbia physicist figured, "would produce 7,000,000 kilowatts, or 12 percent of the total U. S. electric power consumption."

It would be far in the future, if at all, that so grandiose a scheme would be realized. But those who should know best the power of the peaceful atom are thinking big. And at least some of their thinking appears to be due for early translation into fact. END

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Write today, simply giving your name, address and year of birth. Mail to Old American Insurance Co., 1 West 9th, Dept. L 980M, Kansas City, Mo.

Britain building big tires

THIS massive tire being lifted from a mold at the Dunlop factory is England's largest. It has a 7½-foot diameter, 2½-foot tread, 36 plies of woven nylon and weighs a ton. It can support 20 tons of earth-moving equipment.

Crane operator sits high

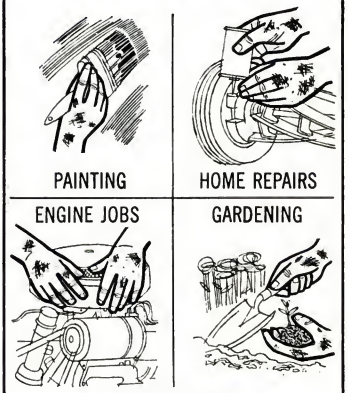
NEWEST in East German cranes is this 130-foot hoist with a 60-foot boom. It is guided by a man in a crow's-nest on the mast. The big derrick folds flat, boom against mast, for horizontal transport by rail or road.

Panels form no-nail box

NOT a nail or steel band is used in a new kind of packing case made in Sweden. The empty cases collapse for storage (above), but there are no loose parts to get lost. As the plywood panels are unfolded (below), built-in metal fittings are slipped into place. They fasten the sides and lid automatically.

The case is coated inside and out with plastic lacquer, and the lid can be sealed and locked to protect the contents.

ON ANY DIRTY JOB



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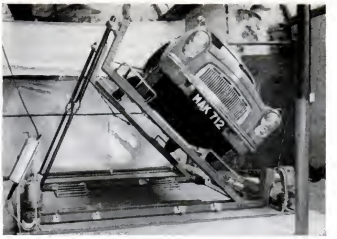
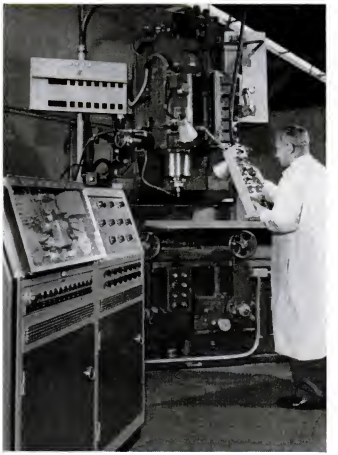


Tilter tips cars four ways

THIS English hoist lets a mechanic work on the underside of a car with less inconvenience. It not only raises the car—it tilts it to either side, or puts the front or rear high in the air. The adjustable tracks are lifted on worm screws worked by a one-horsepower motor. No garage-floor excavation is needed.



Brain bosses machine

TOOLMAKERS are cutting costs with automation. When a "brain" (foreground) is hooked up to a machine tool, a magnetic tape sets up electrical signals that direct the machine. North American Aviation devised the system for small-lot production of parts and tools.

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RP

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WELDER

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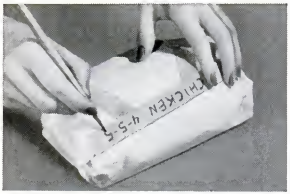

Wrap poultry or meat for freezing with paper molded closely to shape. Seal dependably with "SCOTCH" Brand Freezer Tape. This special moisture-resistant tape sticks tight in sub-zero cold to paper, foil, saran and other films. And you can write the date and label right on it! Get "SCOTCH" Freezer Tape in the handy cutter-edge carton, 35¢ or 98¢ rolls, at your favorite store now.

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Please send me the Reliable Bench Furnace. I am enclosing $8 95 as down payment and agree to pay the balance monthly at $8.50 per month. It's understood that there will be no finance or interest charges added And, if I should fail to make payment when due, the full balance shall become immediately due and payable. **$59.95 F.O.B. Cedar Rapids — $8.95 Down — $8.50 Per Month For 6 Months**

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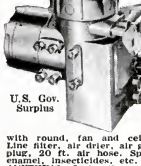
Lamp does it with flowers

THIS bouquet sheds light instead of petals. Its stems carry electric wiring for small light bulbs at the center of each carnation. The flowers are plastic—won't wilt or need water. Hellum-Elektro-Licht GmbH., Coburg-Bayern, Germany, designed the lamp for TV lighting.

ALL NEW



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Dragon-Skin Can't Clog like sandpaper, even when you're smoothing softest wood. Chips and dust fall right through the holes. Slap the sheet once and it's clear!

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● Powerful fully reversible ball-bearing gear reduction winch. 1000-2000 lb. pull. Use on 6 or 12-v battery. Hold- 40' of ¼" cable. For trucks, docks, boats, Govt. cost $280. ..... $46.75 FOB

ELECTRIC CAR MOTOR

● Runs on 6 or 12 volt batt. Powerful gear reduction. Reversible. Cost $295. SALE $19.72 FOB

SPEED REDUCER

3 80-to-1 gear reduction unit. 8 roller bearings, multiple gears. Reduces standard motor to 21 rpm—increases torque. Shafts ⅝" input, 1¼" output. Power winches, revolving signs, door openings, etc. Govt. cost $66. SALE ..... $8.49 Ppd.

HYDRAULIC SPEED REDUCER

● Variable hydraulic speed reducer. Any speed from 0 to 50 rpm by simply throwing a lever. Handle up to 1½ h.p. Instant reverse at any speed. Use for midget cars, shop hand saws, etc. 12"x8"x9". Govt. cost $400. SALE ..... $49.50 FOB

SPECIAL OF THE MONTH!

ELECTRICAL INTERVAL TIMER

● Brand new 115-v 60-c motor timer. Will sound built-in alarm at end of any pre-set period. Range 1 min. to 24 hrs. Shows remaining time on moving hand. Useful cooking, factory, photography, etc. Attractive chrome 3½" dial. Easily mounted. List $8.50. SALE ..... $2.39 Ppd.

DIAL PHONE

● Modern hi-efficiency attractive dial phone. Use for extension to main line on private system. Use several for complete private system, etc. complete with ringer, dial, etc. Work on any system. Govt. cost $25.95. SALE ..... $9.95 Ppd.

Close-outs in pumps, hydraulics, electronics, miscellaneous. Write for catalog.

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Fastest cutting new Speedbor "88" for electric drills. Bores 1" holes 2½" deep in just 60 seconds. Increases the average boring range of small power drills. Sizes ¼" to 1", $.75 each. Sizes 1⅛" to 1½", $1.25 each.

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Science Learns About Hurricanes

[Continued from page 101]

upon the container and bottles are jettisoned and the radio begins broadcasting its position. An automatic ballasting device is designed to keep the balloon at a constant height, while the inward components of winds blowing inside the eye should keep it within the center.

Thus the beacon will be transmitting the position of the eye with which it moves. The beacon's range, now 300 miles, will be increased in future models. Says Robert H. Simpson, director of the NHRP, "Perhaps eventually we could stay at home and dial our phones to learn the hurricane's position."

- Kitoons. Strangely navigable camera-equipped balloons would be launched from our coasts. Such a device would first rise to 15,000 feet, the region of the westerlies (winds blowing from west to east), which would carry it toward the hurricane. Automatic controls, releasing ballast, would then cause it to rise above the storm, snap pictures of the hurricane center, and then rise still farther into the 90,000-foot altitude at which the easterlies prevail. These winds would blow it west. Once the balloon is over land or near enough to the coast for recovery, gas would be released to bring it down.
- Photographic rockets. They can rise higher than any balloon to take photos of storms from heights of 50 to 100 miles. These are two-stage rockets with cameras in their noses. After snapping its pictures, the nose will drop off, parachute down to the sea, and broadcast a "come-get-me" signal so that it can be recovered by a ship.
- A seeing-eye satellite. Scheduled to go into orbit sometime this summer, it may already be aloft as you read this. It will survey the cloud cover surrounding the earth once every two hours and transmit its observations. Such a satellite might spot the very beginning of a hurricane.
- A network of 21 rawinsonde stations. Operated by the U. S. and seven other nations in the Caribbean area, these take upper-air soundings above 80,000 feet. Data recorded include wind speed and direction, atmospheric pressure, temperature and humidity.
- Long-range radar stations. At least four of them will now spot hurricanes as

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*400 AMP Gen. with above accessories—$64.50.

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HEAVY-DUTY RHEOSTAT Ideal for regulating voltage on electric welders. Rated 5.75 Ohms, 100 Watts with double windings & dual female 23 amp. 125 V. receptacles. 7" ht x 5¼" D. Shpg. wt. 2½ lbs. Approx. GOVT. COST $25. Brand New. **$2.25** ppd.

DUPONT EXPLOSIVE RIVETS Essential wherever blind riveting required. 1/8", 5/32", 3/16". Round & flat heads. Approx. GOVT. COST 32c ea. 1,000 assorted for only **$6.00** ppd.

"SUPER 9" 200 AMP WELDING KIT With Deluxe accessories consisting of one 200 AMP Gen., adjustable helmet, electrode holder, 30' welding cable, rheostat, giant toggle switch, voltmeter, voltage rec., 1 pr. heavy-duty welder's gloves. All units guaranteed pre-tested. Approx. GOVT. COST $500. Most items new—all perfect. **$26.00.**

WELDING CABLE AIRCRAFT QUALITY Heavy-duty, neoprene, fiberglas insulation. Will handle 400 Amps plus. Approx. GOVT. COST $40. NEW. 50' lengths, **$12.50.**

REVERSIBLE REDUCTION GEAR Tremendous inertia power for 6-12-24 volt winch with 2 power take-offs! Use on boats, trucks, wreckers, etc. Fantastic power for pennies of original cost. Weight 55 lbs. Approx. GOVT. COST $475.00. New—**$17.95.** 2 for **$34.50.**

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FREE Ask for Catalog All Models Benjamin Single Shot and Repeaters . . . Cal. BB or 177 or 22. ALSO, SPECIAL OFFER ON HUNTING AND FISHING KNIVES, ETC.

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Now any one can weld, cut, braze or solder almost any metal quick, safe and easy with this professional type welder. Make repairs in home or shop and farm; repair auto bodies and fenders, build wrought iron furniture, railings, fences, etc. — 1001 metal items. No previous experience necessary. Designed to operate on any properly wired 110 V. A.C. line. Order today! Literature on larger industrial equipment on request.

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75 Mounted Wheels & Miniature Cutters. Regular $11.00 value $4.98 Post-paid

For cutting and grinding on wood, metal or plastic. Includes 26 mtd. wheels and points on 3/32" shanks; 24 miniature cutters on 3/32" shanks; 25 short shank min. cutters. Will fit all electric drills and hand grinders.

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Fits all electric drills & hand power tools. 33½" long. Oilite bearings. Core of specialty wound, high carbon steel wire in flexible steel casing. Will accommodate tool shafts up to 1/8" dia. For lathes, electric drills, etc.

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Fits in the palm of the hand and has an air-cooled motor that runs at 20,000 rpm AC or DC at 110 volts. Comes complete with both 3/32 and 1/8 inch Col-lets, cord and plug... **$11.50** P.P.

7 H.S. and carbon drills from 6" to 12" in length. Assorted sizes up to 1/4" diam. for drilling in hard to reach places. A reg. **$1.95** P.P. $10.00 val. for only

12 MOUNTED WHEELS and points on 1/8" shank **$2.95** P.P.

36 for 7.50p.p.

For grinding on plastic, wood, soft & hard metals. Regular Value $8.00. **18 Mounted points on 3/32" shank $2.50; 12 mtd. wheels on 1/4" shank $3.60.**

18 Rotary Cutters $5.85 P.P.

Assorted sizes cutters on 1/8" or 3/32" shanks. Will fit all hand grinders. Ideal for cutting wood, metal, or plastic. Brand new.

ADAPTER CHUCK

With 2 interchangeable collets, opening from 3/32" to 0, on 1/8" mandrel. **$1.50** P.P. Price each only.....

10 HIGH SPEED STEEL REAMERS—Straight and Taper Shanks—all brand new and in excellent condition. Reg. $25.00 value, **10 for .... $4.50** P.P.

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CHICAGO—Sept. 1st. Just introduced is a Free Booklet on a New Discovery which enables the Home Owner, Janitor, or Factory Maintenance to clean any Clogged Sewer Drain.

Yet anyone can operate this new **Plumbers Flushing Gun** which releases air pressure on a solid shaft of water cleaning the most stubborn stoppages up to 200 feet. TOILETS, SINKS, URINALS, BATHTUBS, FLOOR DRAINS, and HOUSE-TO-STREET SEWERS clogged with Grease, Rags, Sand, Roots, and paper melt away instantly when struck by the Hammer-like blow of this new unit.

There is no need to remove wall or pipe, or Grease Trap. A special attachment allows water to flow from the faucet through the Gun while air is released on the pipe. Vents or stacks are no obstacle, as force tends to strike wherever the water lays. But now, what is this Plumbers Flushing Gun worth in **COSTLY PLUMBING BILLS SAVED?** Tear this Ad out—and write your name and address beside it for **FREE BOOKLET.** Obey that urge. No agent will call. A postcard will do! Chicago Phone Kildare 5-1702

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Science Learns About Hurricanes

far away as 300 miles out in the Atlantic Ocean.

Can hurricanes be controlled? Most weathermen are still doubtful. Thirty years ago a Senator suggested that U. S. battleships fire shells into hurricanes to break them up. Dynamite, blockbusters and helicopters have also been recommended. Some would have the Weather Bureau use atomic bombs (as distinct from that part of the public which believes the bomb tests *cause* hurricanes).

"But," says an expert, "people forget the scope of the animal we're dealing with. To fight a seething mass of a million cubic miles of concentrated fury is far beyond our present ability. To calm it we'd need a couple of tranquilizers the size of Texas."

How about seeding hurricane clouds with dry ice? That might start new downpours and upset the system's internal dynamics. It might just possibly cause a hurricane to change course. But most weathermen are against it, pointing out that if the storm is already near the coast, effective seeding might turn it toward the mainland. If it is far enough from land to be safe for experiment, it would be too far out for planes to reach.

The NHRP's director, Robert Simpson, feels one of our best hopes would be a jujitsu approach—getting the monster to use its own strength to defeat itself. There may be, he says, "power brakes or power-steering mechanisms in the hurricane structure that we could activate to change its path or weaken it. Maybe one day we'll be able to take a big storm by the hand and lead it aside." END

In 106 Cities—LOVE LETTERS

. . . get there faster if you put the postal delivery zone number on the envelope.

The Post Office has divided 106 cities into postal delivery zones to speed mail delivery. Be sure to include zone number when writing to these cities; be sure to include your zone number in your return address—after the city, before the state.

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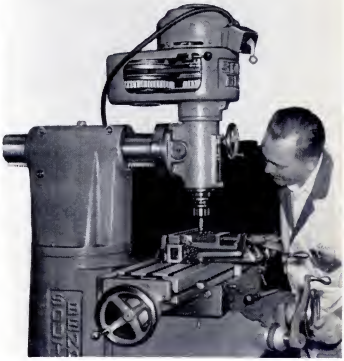

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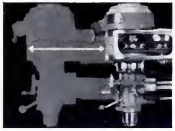

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Up to 24 months to pay

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Giant fingers have light touch

ELECTRICALLY operated knuckle joints in the "tusks" of this big LeTourneau machine allow them to be used like powerful steel fingers. They can handle loads up to 22 tons with delicate precision.

Toy-size, but washes dishes

THE doll-size restaurant-type dishwasher above does a real job. It's a working model built to scale by Economics Laboratory, of St. Paul, Minn., to demonstrate use of its dishwashing detergents.

Lighter truck—bigger load

CALLED the largest aluminum dump truck in the world, this vehicle is 30 feet long and has a capacity of 37½ cubic yards. It was built by Mack for Alcoa bauxite mines in the Dominican Republic.

SAVE ON PALLEY OPTICAL BARGAINS

8 POWER ELBOW TELESCOPE

Has large 2" objective lens — Kellner eyepiece and Amici erecting prism. Cross-hair reticle is illuminated internally. Has three built-in filters; neutral, red and amber. Field 325 ft. at 1000 yds. Eyepiece alone is worth $12.50. Buy whole unit for only . . . . NOW 9.88

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Made of sturdy brass and steel. Contains a Kellner eyepiece, reticle, 2 achromatic erector lenses, 1 achromatic objective lens (25mm diam.) with all optics coated. Length 22-1/2". Field 12°, 19 ft. NOW 4.88

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45 to 70X

Kit contains precision made objective lenses of excellent quality. Also glare reducing filter, focus and lock adjustments, barrel, mounting bracket and quality tripod. ALL at our extra special importer-to-you SAVE 60% at Palley's 14.95

NEW 20 Power 40mm SPOTTING SCOPE with TRIPOD and CARRYING CASE

A real Palley Bargain! Has 20 Power magnification yet is small enough to fit easily in your gun case, knapsack, etc. Lenses are precision ground and polished. Objective lens is fully coated. Adjustable focus eyepiece. With steel tripod & leatherette case. Weight 15 ozs. Overall length of scope 8-3/8". ALL NEW ! . .

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Here's an Amazing Surplus Army Bargain! A huge chest full of precision, electronic parts & equipment. Contains meter, tubes, tube sockets, rotary & toggle switches, potentiameters, high voltage extension cable & jack, plus others. The tempered hardwood case has heavy duty hinges with trunk type latches. This exceptional case alone is worth our low price! 17.95

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A professional type, drafting machine. Small enough to fit in brief case. Ideal for use in classroom, office, factory, studio, home, etc. Made of black anodized aluminum. Has 6" x 3" scale. Designed to clamp on 11" x 17" drawing board. . . . 3.95 WITHOUT BOARD

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Professional Log-Log, Decimal Trig Slide Rule. Non-warping top quality bamboo — 2-color scales on white nitrate facing. Scales are L, LL1, DF, CF, CIF, C1, C, D, LL3 & LL2 on one side. Other side LL0, LL00, A, B, K, CI, C, D, S, S T & T. With cursor and 16 pg. book. . . 10.95

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Mechanic gets a boost

WITH this hook-on step even short mechanics can easily get at GM's big British-built Bedford trucks. Footboard and frame, held by brackets against the chassis, hang from the towing eyes.

Egg bounces on plastic foam

A RAW egg dropped 10 feet onto a block of flexible urethane foam landed with shell intact. Purpose of the experiment was to test the cushioning effect of Allied Chemical's soft synthetic material.

How hot is a hot griddle?

THE wires sprouting from this Navy grill took spot temperatures and showed up hot and cold spots. Now commissary researchers believe they have licked uneven heating with a new aluminum-alloy top.

Flashlight tests car bulbs

AN EXTERNAL hot contact on a British flashlight checks tail-light bulbs, fuses and low-resistance units. With the switch off, the flash lights if the part is good. It also tests plugs and cords for shorts.

This One
W6WH-R4P-PRRT

These men chose their schooling— so can you!

Pvt. Robert K. R. Smith
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"I took the exact Radar course I wanted, thanks to the Army's technical training program for high school graduates. Now I'm working in electronics. You can pick an Army course that fits your interests, too—and only the Army guarantees you the training you want before you enlist. So if you want to be sure you get what you want, you ought to see your Army Recruiter and find out about this terrific program."

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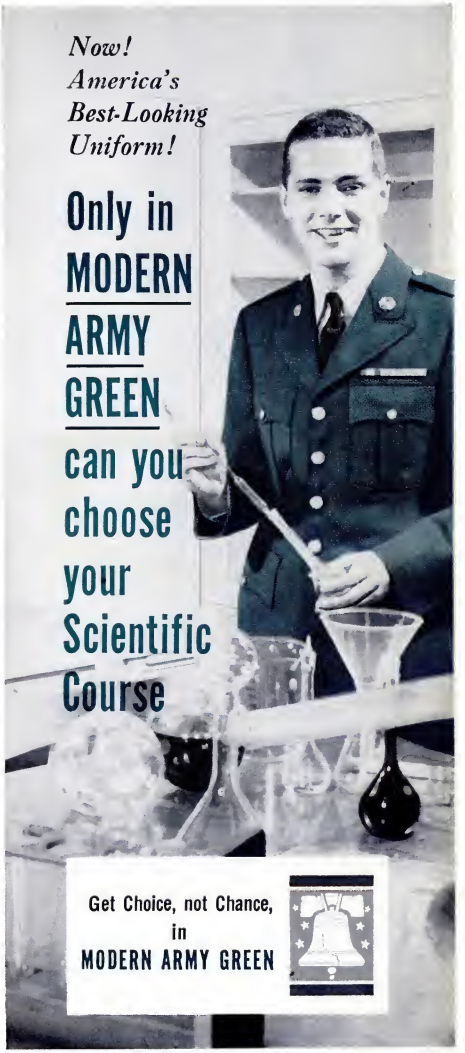

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A Genuine
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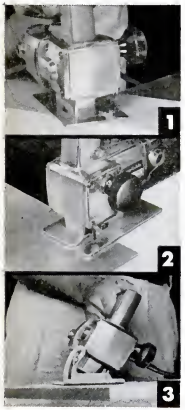

The Porter-Cable 152 Hand Saw is the only saw with the patented insert disc which virtually eliminates chipping and insures a smooth, even cut on plywood, plastic laminates and other materials. It's the all-purpose saw for home or workshop—hack saw, scroll-saw, cross-cut saw, jig saw, keyhole saw, coping saw and rip saw.

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2 CUTS METALS, TOO—¼" aluminum, ⅛" steel! Sheet metal, fittings, bar stock, and pipe are cut quickly and cleanly.

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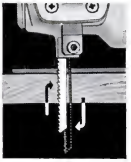

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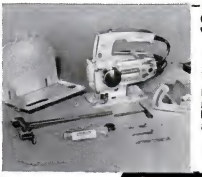

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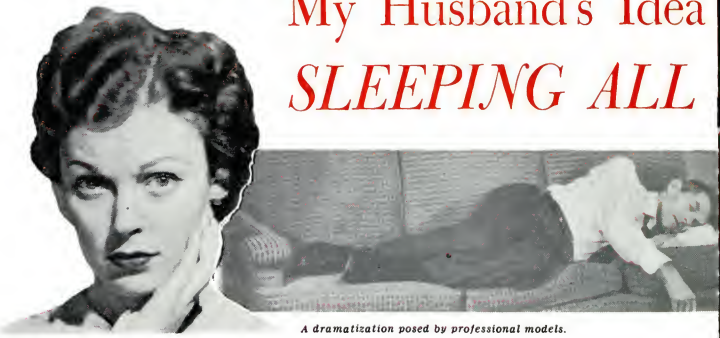
I'm worried...

My Husband's Idea

SLEEPING ALL



A dramatization posed by professional models.

WHAT can you do when your husband acts like an old man . . . when he doesn't enjoy anything better than sleeping all day Sunday, and is "too tired" to have fun with his family — go visiting, to a movie, dancing? What's the answer for a man who has lost his strength and vigor while still young?

Those questions used to worry *me* all the time. For some unknown reason, my husband had been robbed of his energy and vitality, and I just didn't know what to do. Then I saw a Vitasafe ad in the newspaper. It told how men — and women — may feel worn-out, nervous and irritable due to an *easily corrected*, deficiency of vitamins, minerals and lipotropic factors in their diets.

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FREE 30 days supply High-Potency Capsules

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Safe nutritional formula containing 27 proven ingredients: Glutamic Acid, Choline, Inositol, Methionine, Citrus Bioflavonoid, 11 Vitamins (including blood-building B-12 and Folic Acid) plus 11 Minerals.

To prove to you the remarkable advantages of the Vitasafe Plan . . . we will send you, without charge, a 30-day free supply of high-potency VITASAFE C.F. CAPSULES so you can discover for yourself how much stronger, happier and peppier you may feel after a few days' trial! Just one of these capsules each day supplies your body with over *twice* the minimum adult daily re- *full concentration* recommended by the Food and Nu tion Board of the National Research Council for the ot four important vitamins! Each capsule contains the an ing Vitamin B-12 — one of the most remarkable nutri science has yet discovered—a vitamin that actually h strengthen your blood and nourish your body organs

Glutamic Acid, an important protein derived f natural wheat gluten, is also included in Vitasafe C sules. And to top off this exclusive formula, each cap now brings you an important dosage of Cit Bioflavonoid. This formula is so complete it is avail nowhere else at this price!

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Choline Bitartrate	31.4 mg.	Niacin Amide	40 mg.
Inositol	15 mg.	Calcium Pantothenate	4 mg.
dl-Methionine	10 mg.	Vitamin E	2 I.U.
Glutamic Acid	50 mg.	Folic Acid	0.5 mg.
Lemon Bioflavonoid Complex	5 mg.	Calcium	75 mg.
Vitamin A	12,500 USP Units	Phosphorus	58 mg.
Vitamin D	1,000 USP Units	Iron	30 mg.
Vitamin C	75 mg.	Cobalt	0.04 mg.
Vitamin B_1	5 mg.	Copper	0.45 mg.
Vitamin B_2	2.5 mg.	Manganese	0.5 mg.
Vitamin B_6	0.5 mg.	Molybdenum	0.1 mg.
Vitamin B_{12}	2 mg.	Iodine	0.075 mg.
		Potassium	2 mg.
		Zinc	0.5 mg.
		Magnesium	3 mg.

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